2.0 PROJECT ALTERNATIVES

This section describes the seven project alternatives and related information as required by applicable CEQA and NEPA guidelines and regulations. The first alternative is the No Project alternative. The Proposed Project and four other alternatives involve rotenone treatment of Lake Davis and its tributaries at differing reservoir elevations and volumes. The seventh alternative is a non-chemical alternative that involves the complete dewatering of the reservoir and its tributaries. These alternatives were selected based on an evaluation of a broad range of actions and options described in the Alternatives Formulation Report (Appendix C). Additional project information is provided in Appendix D, and neutralization options are explained in detail in Appendix E.

2.1 Project Area and Vicinity

The California Department of Fish and Game (DFG) and the U.S. Forest Service (USFS) are preparing a joint Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the proposed Lake Davis Pike Eradication Project. Lake Davis is a State Water Project (SWP) reservoir located within Plumas County and the Plumas National Forest, approximately 6 miles upstream of the confluence of Big Grizzly Creek with the Middle Fork Feather River and 5 miles north of the City of Portola on State Highway 70. Figure 2-1, Vicinity Map, shows the project area and a larger area within the vicinity of the project area that could be affected by the project alternatives.

The relationship of the project area to the Sacramento-San Joaquin River Delta is shown on Figure 2-2, Delta Map. Lake Davis drains into the Middle Fork Feather River, which terminates at Lake Oroville. From Lake Oroville, water flows into the Feather River, then into the Sacramento River, and then into the Delta. This is the path pike could take if they were to move downstream from Lake Davis.

The EIR/EIS project area comprises the area directly affected by the project alternatives, including treatment and neutralization activities: Lake Davis, waters draining into Lake Davis that may contain pike, and a portion of Big Grizzly Creek below Grizzly Valley Dam. The project area is represented by the watershed of Lake Davis and the portion of Big Grizzly Creek below the dam that flows to the Middle Fork Feather River, as shown on Figure 2-3, Project Area. Tributary streams to Lake Davis would be treated and the largest of these are highlighted on Figure 2-3, along with proposed staging areas for both the reservoir and tributary treatments.

2.2 No Project/No Action

The No Project alternative would continue the existing reservoir and fishery management practices into the foreseeable future. These practices are consistent with the current, adopted plan to control pike. The goal of the current plan "Managing Northern Pike at Lake Davis, A Plan for Y2000," known as the *Y2000 Plan* (DFG 2000), is to control the population of pike in Lake Davis and to keep the pike contained in the reservoir. The containment of pike is likely temporary, and control of the population has not been achieved by the current plan. There would be no forest closure or special use permit issued to the DFG, and recreation activity would continue similar to recent years.

The *Y2000 Plan* calls for adaptive management, allowing for the periodic assessment of recommendations. The DFG periodically evaluates and assesses progress (DFG 2003a). Due

to the fact pike pose a serious threat to aquatic resources in California, future management plan evaluation may result in recommendations to change the Lake Davis fishery management program. Any significant changes to the program would be done in consultation with the Lake Davis Steering Committee.

2.2.1 Reservoir Operations

Lake Davis is operated by the DWR for recreation, fish and wildlife enhancement, and water supply. The spillway elevation of the reservoir is 5,775 feet, which provides a capacity of about 84,000 acre-feet and a surface area of about 4,000 surface acres. Lake Davis is currently managed to operate below its capacity primarily to minimize the potential for pike escapement.

Releases to Big Grizzly Creek downstream are dictated by an agreement between the DWR, DFG, and USFS, consistent with the DWR's two Water Rights Permits for storage and use of Big Grizzly Creek water (permits 15254 and 15255). The reservoir captures seasonal precipitation and snow-melt runoff each winter through spring. Maintenance of minimum downstream releases range from 10 to 23 cubic feet per second (cfs), dependent on maximum May-June reservoir surface elevation, results in the reservoir normally losing several feet of elevation over the course of summer through fall. Independent diverters take some of this water from Big Grizzly Creek at points downstream from the dam.

Higher controlled releases, sometimes exceeding 200 cfs, are occasionally made when there is or is likely to be sufficient inflow to potentially fill the reservoir. Since the rediscovery of pike in 1999, the DWR has operated Lake Davis in this manner to avoid spill that could cause erosion below the spillway or that could release pike into Big Grizzly Creek and beyond.

Under this management regime, reservoir elevation has typically fluctuated between 5,761 and 5,768[1] feet over the course of recent years. At an elevation of between 5,761 and 5,768 feet, the volume of Lake Davis is between about 38,187 acre-feet and 58,706 acre-feet, and the surface area is between approximately) 2,565 acres and 3,302 acres (Appendix D, Reservoir Elevation Area–Capacity—Maximum Discharge Ratings). Since 1997, the median minimum reservoir elevation is approximately 45,000 acre-feet (5,763.5 feet elevation). This is considered normal operating volume in January.

Water from Lake Davis can be delivered via a direct pipeline to a Plumas County Water Treatment Plant for municipal uses. However, the treatment plant has not operated since 1997, and no water has been delivered from Lake Davis to the treatment plant since then. Construction and approval of a new treatment plant is anticipated in April 2008, at the earliest. (Howell, Department of Health Services, personal communication, 2006; Dwyer, U.S. Army Corps of Engineers, personal communication, November 29, 2006; Perrault, Plumas County, personal communication, November 29, 2006.) When it is approved, it would be available to receive water deliveries from Lake Davis (Dwyer, personal communication, 2006; Hunter, personal communication, 2006).

[1] Based on operations since implementation of the *Y2000 Plan* (2001–2005)

Figure 2-1 Vicinity Map

Figure 2-1 BACK

Figure 2-2 Delta Map

Figure 2-2 BACK

Figure 2-3 Project Area

Figure 2-3 BACK

2.2.2 DWR Pike Containment System

In May 2006, the DWR approved a containment project that is known as the Northern Pike Containment System at the outlet of Lake Davis on Big Grizzly Creek. The project purpose is to prevent any live life stage of pike from moving through the outlet structure downstream into Big Grizzly Creek, and into the Feather and Sacramento River system, in furtherance of the CALFED Bay-Delta Ecosystem Restoration Program goals. The DWR anticipates that the new containment system will be installed in the summer of 2006. After installation, discharge from the reservoir outlet could flow through up to eight "strainers" that would remove all material 1.0 millimeter or larger before discharging into Big Grizzly Creek, which flows into the Middle Fork Feather River. The 1.0 millimeter strainer openings will prevent undamaged pike eggs and larvae, in addition to larger pike, from passing through the strainer. After passing through the strainer system, the water will be released into Big Grizzly Creek. The new containment system could operate 24 hours a day. When the strainers are not in use, flow will be released through the emergency outflow pipe. A grater similar to the existing grater on Grizzly Valley Dam will be fitted onto the end of the emergency outflow pipe to reduce the potential for live pike moving downstream. This DWR project is independent of and separate from the DFG's Proposed Project. This is an interim measure that is intended to be in place until special operations at Lake Davis are no longer required.

2.2.3 Other Pike Control Measures

Several recommendations were outlined in the *Y2000 Plan* (DFG 2000) to control and contain the pike population in Lake Davis. The *Y2000 Plan: Three Year Report* (DFG 2003) report describes various control and containment measures that have been implemented to control and contain pike in Lake Davis. A summary of these measures is described below:

1. **Experimental control measures such as using detonation cord to capture pike using controlled blasting.** Detonation cord was tried, but found to be intensive, expensive, and minimally effective; it was discontinued in 2003.
2. **Grate barriers.** Several grate barriers were used to prevent pike movement into upstream tributaries. Initial sampling determined that this method was effective on Freeman and Cow creeks, but not on Big Grizzly Creek (DFG 2003a). To date, these barriers have only been evaluated in years with low flows. The effectiveness of these barriers during wetter years is still unknown. These barriers remain in place and continue to be maintained.
3. **An experimental barrier/trap net to determine if blocking in-reservoir spawning areas may be effective.** This method was ineffective because of the abundant pike spawning habitat throughout the reservoir.
4. **Controlling or eliminating the pike population at Lake Davis through angling.** This method is believed to be ineffective, as an experimental trial resulted in one 12-inch pike captured during 45 hours of angling effort. In addition, the DFG does not encourage pike angling because of the danger of spreading pike to other waters.
5. **The use of drag nets, purse seines, gill nets, and electrofishing.** The *Three Year Report* recommends continuing these methods and intensifying the catch effort during the spring spawn. The use of electrofishing boats and backpack electrofishers is effective and is

recommended to continue. However, the use of electrofishers to "herd" pike into traps and nets is not effective and is no longer used.

6. **Modifications to Grizzly Valley Dam outlet.** There is a fish grater on the outlet, built to impede the passage of adult pike from the reservoir to the Big Grizzly Creek downstream of the dam.
7. **Fyke and trap nets employed immediately following spring ice-out.** Fyke nets (which are long, bag-shaped fishing nets held open by hoops) and trap nets (which are similar) are commonly used to catch fish in still waters such as a lake. This method is effective at catching pike during the spring spawn and should be continued.
8. **Use of Brown Trout as a Predator on Pike.** The use of brown trout as an effective pike predator has not been proven and is no longer recommended.

Enforcement measures and penalties for the unlawful movement or introduction of pike have been increased, and law enforcement efforts continue. Public education pertaining to the pike situation in Lake Davis has been effective, and further education and outreach is on-going. Existing regulations and potential new regulations can also be used to manage the pike population.

The activities identified above are existing management actions to control and contain pike. These activities are thus considered part of the No Project alternative.

Despite the implementation of control and containment measures and the experimental procedures described above from 2000 to the present, the pike catch rate increased tenfold between 2000 and 2004. This suggests that the pike population in Lake Davis continues to expand and that the control measures being used are inadequate to compensate for pike fecundity. In 2006, small pike were found for the first time in the cove near the dam spillway. Therefore, it is likely that the pike population in Lake Davis will increase under the No Project alternative and will eventually escape downstream, either over the spillway or through the dam outlet or by intentional or accidental human transport (see Section 7.1.2.3 for a detailed discussion). In fact, on May 20, 2006, the DFG conducted a checkpoint at Lake Davis and discovered that anglers are moving live pike from the reservoir. Of 71 vehicles that were inspected, five pike were found, two of which were alive. The five pike were confiscated.

2.3 Proposed Project/Proposed Action – 15,000 Acre-Feet (Plus Treatment)

Under the Proposed Project, the reservoir would be drawn down to 15,000 acre-feet and a liquid rotenone formulation would be applied throughout the reservoir, tributary streams, and to pools, ponds, or springs in the watershed potentially containing pike. The method of application is described in detail in Section 2.3.2. With a volume of 15,000 acre-feet, the surface elevation of Lake Davis is about 5,749 feet and the surface area is about 1,331 acres. Project implementation would commence with reservoir drawdown for the project in combination with normal DWR winter/spring dam operations as early as January 2007, followed by rotenone application starting between mid-August and late October of 2007.

Based on a visual estimate from USGS quadrants (quads), about 34 miles of streams, including the main tributaries and their sub-tributaries, would need treatment. Not all areas marked on the quads (particularly the sub-tributaries) would likely be flowing during the proposed rotenone application time period. Application in many of these areas would be made by drip station. A drip station is a tool designed to allow for controlled application of rotenone in running water at specific locations along a stream course. If the drip stations were placed 0.5 miles apart on the main tributaries (Big Grizzly, Freeman, and Cow creeks), 27 stations would be required. The length of flowing streams, and therefore the number of drip stations needed, varies considerably depending on the amount of precipitation and snowpack during the previous months. In dry years, some sections of the streams are dry and would require no drip stations. In wet years, the summer headwaters of the tributaries would tend to be further up in the watershed, and there would be a greater length of flowing water. In wet years, and depending on the exact time of treatment, combined flows of the three major streams can exceed 100 cfs during the spring/early summer. If unusual weather conditions were to cause tributary streams to flow over their banks, the project would be delayed until the streams were no longer flooding.

Features of the Proposed Project are presented in Table 2.3-1.

2.3.1 Reservoir Drawdown and Refill

Reservoir drawdown and refill operations under the Proposed Project would be different than under the No Project alternative. Four main factors affect drawdown and refill timeframes: the amount of water coming in to the reservoir (inflow) in any given year, evaporation, the amount of water that is released (outflow) and the reservoir level when drawdown or refill is initiated. Because inflow and evaporation are not predictable, these factors must be estimated based on the historical record. To estimate the amount of time needed to draw the reservoir down to treatment levels or refill the reservoir after treatment, the DFG developed a Drawdown/Refill Model. A description of the model, model results, and historical inflows are provided in Appendix D. Outflow is based on the amount of water that can be physically released through the dam. This rate is affected by the amount of water in the reservoir, by which outlet valve(s) are used, and whether or not pumps are used to take additional water out of the reservoir. Outflow may be constrained during some periods by the needs of downstream water users. Although these constraints have not been incorporated into the model output, they are addressed as mitigation in the affected resource sections such as recreation and public services (water rights). Each of these factors is combined to provide estimated timeframes within which the reservoir would be at specific levels (see Appendix D). These estimates are used to assess impacts for various resources.

The following assumptions are used in the modeling results presented for each alternative:

- Reservoir volume would start on January 1 at 45,000 acre-feet;
- The maximum possible flow would be released from the reservoir from January 1 until the target elevation is reached; and
- Release flows would not be constrained by downstream uses.

Table 2.3-1. Features of the Proposed Project

Feature	Proposed Project
Description	Lower reservoir to 15,000 acre-feet and treat with liquid rotenone
Reservoir surface elevation	5,749
Miles of stream	34
Approximate standing water surface area (acres)	1,331
Treatment	
Reservoir treatment volume (acre-feet)	15,000
Time to Drawdown[1]: Number of years treatment volume target is predicted to be reached by the identified date in 38 years modeled without supplemental pumping; numbers in parentheses are the number of years treatment volumes could be reached with supplemental pumping.	Aug 1: 21 (27)
	Sept 1: 27 (34)
	Oct 1: 34 (36)
Time to refill to 45,000 acre-feet (months)	5 to 79 months 75% likelihood of refill by 21 months post-treatment
Type of Treatment	
Agent	CFT Legumine® or Noxfish® (liquid) plus gel balls from powder (possible)
Estimated rotenone amount-reservoir	5,000 gallons
Estimated rotenone amount-streams [2]	260 gallons
Estimated number of drip stations[2]	27
Access and Staging	
Reservoir staging locations	Primary: Honker Cove Boat Launch Area Potential Additional: Camp 5 Boat Launch Area Mallard Cove Boat Launch.
Stream staging locations	Indicated on Figure 2-3.
Staging area (acres)	<5
DFG reservoir access locations (ramp sites)	Honker Cove Camp 5 Mallard Cove
DFG access routes to streams and springs	General access would be by vehicle along existing roads. Other access will be by foot traffic and/or off-highway vehicles (OHVs). Use of OHVs would be determined during season prior to application and in consultation with the USFS. Routes dependent on runoff situation.

Table 2.3-1. Features of the Proposed Project

Feature	Proposed Project
Fossil-fueled equipment (hours of use)	
Helicopter	0
Watercraft	1,500
Vehicles	6,000
Pumps (dewatering tributaries & reservoir)	0
Pumps (potential supplemental pumps to dewater reservoir)	0-2,184
Pumps (rotenone application)	320

Notes:

1. Time to Drawdown: The frequency of years in which the target treatment volumes would be achieved by the identified dates. Calculation of this value is based on reservoir inflow and elevations in years from 1967 through 2004 (38 years). In these calculations, it is assumed that the starting volume of the reservoir is 45,000 acre-feet on January 1 of the year of treatment. The number in parentheses indicates the number of years assuming supplemental pumping is employed. Pumping is based on a pumping rate of 75 cfs during the months of April, May, and September. No pumping is assumed to occur during June through August to accommodate downstream recreation. These probabilities do not include any additional flow reductions for downstream users. If such reductions are made, an additional 600 acre-feet would remain in the reservoir for every 1 month of 10 cfs reduction. If flow was reduced by 100 cfs for two months (mid-June to mid-August), an additional 12,000 acre-feet would remain in the reservoir on September 1.
2. Stream treatment assumptions: 10 cubic feet per second total streamflow, drip stations every 0.5 mile--= on main tributaries and two back-to-back stream treatments.

2.3.1.1 Drawdown

As described above, the amount of time needed to draw down the reservoir depends on operational and climatic conditions at the time of drawdown. The likelihood that the reservoir would reach the target volume (15,000 acre-feet for this alternative) by a given date is provided as the number of years in the 38-year period of record that the reservoir would have reached that elevation. This estimates the likelihood that a particular scenario could be implemented during a given month as well as helping to describe how long the reservoir would be drawn down to particular levels. For convenience, we provide the number of years the reservoir would reach the target volume by August 1, September 1, and October 1. The August 1 number is provided for reference only, since a treatment would not begin before mid-August. Without pumping the model predicts that the reservoir would be at or below 15,000 acre-feet in 21 of 38 years by August 1, in 27 of 38 years by September 1, and in 34 of 38 years by October 1. Assuming supplemental pumping of 75 cfs was employed in April, May and September, the target elevation would be reached in 27 of 38 years by August 1, 34 of 38 years by September 1, and 36 of 38 years by October 1.

Outflow may be constrained during some periods by the needs of downstream water users. Although these constraints have not been incorporated into the model output, they are addressed as mitigations in the affected resource sections such as recreation and public services (water rights). If flows are reduced to accommodate concerns of downstream users on Big Grizzly Creek, the volume of water in the reservoir would be greater on the August to

October target dates. The analyses throughout this document address the impacts of the stated reservoir treatment levels, and do not incorporate outflow restrictions.

2.3.1.2 Refill

The amount of time to refill the reservoir cannot be determined precisely at this time because it would depend on operational and climactic conditions. Accordingly, the likely rate of refilling the reservoir is predicted based on historical conditions as follow. Refilling Lake Davis from 15,000 acre-feet to 45,000 acre-feet, based on the years of record, would require from 5 months to 79 months. In 16 of 33 of the water years of record (48 percent), the reservoir would have refilled to 45,000 acre-feet by June 1 of the first year following treatment. The reservoir would have refilled to 45,000 acre-feet by June 1 of the second year following treatment in 25 of 33 water years of record (76 percent). These calculations assume that discharges from the dam are limited to 10 cfs during the period that the reservoir is refilling. The 10 cfs figure is designed to ensure that Big Grizzly Creek downstream of the dam has sufficient flow to maintain the fishery and riparian habitat.

2.3.2 Rotenone Formulations, Concentrations, and Quantity

Two commercially available five percent rotenone liquid formulations (CFT Legumine®[2] and Noxfish®[3]) are proposed for use, both registered for use in California. The DFG is not considering the 2.5 percent liquid rotenone formulation (Nusyn-Noxfish®) because during the previous treatment in 1997 the synergist (piperonyl butoxide) persisted longer than anticipated. The 5 percent rotenone formulation would be applied at a resulting concentration of 1 milligram (mg) formulation per liter of water (one part per million [1 ppm]), which equates to 0.33 gallons of piscicide [4] product per acre-foot of water (an acre-foot equals about 325,850 gallons). This treatment rate of 1 ppm formulation equates to 50 micrograms (μg) of rotenone per liter of water (50 parts per billion [ppb] of rotenone). If needed, rotenone powder (Cube Powder Fish Toxicant®)[5] would be combined with sand and gelatin to form gel balls to treat large stagnant pools, seeps, and springs associated with the stream treatments. The Proposed Project is to apply a liquid formulation in both the reservoir and in the tributaries.

The total amount of Noxfish® or CFT Legumine® used would vary based on reservoir volume and inflow at time of application. At the application rate of 0.33 gallons of Noxfish® or CFT Legumine® per acre-foot of water, a 15,000 acre-feet reservoir volume would require about 5,000 gallons of the formulation. A maximum of 130 gallons are expected to be required for each treatment of the tributaries, and two treatments are assumed (260 gallons). The precise amount would depend on flow rates, background demand, sedimentation, amount of vegetation, duration of application, construction of temporary upstream fish barriers, and other factors.

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[2] EPA Registration Number 655-805-AA-75338
[3] EPA Registration Number 655-805-AA
[4] Piscicide is defined as a fish killing agent.
[5] EPA Registration Number 655-806-AA

The rotenone formulation would be tested prior to application to verify constituents and concentrations, which may vary slightly between batches of product. Personnel mixing the formulations will follow label (Federal Insecticide, Fungicide, and Rodenticide Act [FIFRA]) requirements. Sand and gelatin gel balls of powdered rotenone would be prepared under a hood to ensure worker safety.

2.3.3 Treatment

This section describes the proposed treatment (application procedures and timing). Detailed technical plans would then be designed after the environmental review process under CEQA and NEPA has been completed and a project has been selected and approved. This would allow consideration of any environmental concerns raised during that process and any resulting conditions of approval to be incorporated. Additionally, later-drafted, detailed technical plans would be more able to anticipate actual on-the-ground conditions at the time of treatment. The treatment would be managed under an Incident Command System (ICS) structure involving appropriate Federal, State, and local agencies, and would be implemented in compliance with applicable Federal, State, and local laws and regulations, including, but not necessarily limited to, label requirements and Occupational Safety and Health Administration (OSHA) regulations.

For the Proposed Project (and other alternatives involving the use of rotenone), the DFG would need to get its boats into the reservoir to apply the rotenone. In addition, the DFG would have to access the chemicals at the shoreline staging area and transfer the chemicals to the boats. The sites identified for these activities are Honker Cove, Mallard Cove, and Camp 5. If the reservoir is lowered below an elevation 5763.6 feet (approximately 45,000 acre-feet), the existing boat ramps would be out of the water and unusable. The DFG would then establish boat access to the reservoir at one or more of these sites by other means such as extension of boat ramps, landing mats, gravel, base rock, grading, and/or other techniques.

2.3.3.1 Application to Open Water

The open water of the reservoir would be treated from boats using Noxfish® or CFT Legumine®. Open water areas would be divided into sectors. The water volume in each sector would be determined, and an applicator crew (consisting of a boat, pilot, and applicator) would be assigned to pump the calculated amount of rotenone into each sector. The rotenone would be applied to the reservoir within the maximum period of 72 hours (3 days) to ensure that the entire reservoir contains the prescribed level of the pesticide at one time.

Resulting rotenone effectiveness would be gauged by placing cages containing live rainbow trout in predetermined areas at predetermined depths throughout Lake Davis. Rainbow trout are less sensitive to rotenone than are pike; rainbow trout have a 24-hour LC_{50} of 3.4 µg/L, meaning that half of the fish are dead within 24 hours when rotenone is at a concentration of 3.4 µg/L, as compared to pike, which have a 24-hour LC_{50} of 2.2 µg/L. Therefore, trout can serve as sentinels to indicate that sufficient concentration of rotenone to kill pike is present throughout the reservoir.

2.3.3.2 Application to Shoreline Areas

The shoreline area would be treated from boats, possibly air boats using a low pressure spray of a 10 percent volume to volume,[6] or less, liquid rotenone solution. The littoral zone of the reservoir (near shallow and inaccessible weed beds) would be treated using shallow draft boats with a jet motor, air boats, or other appropriate equipment, such as spraying from the shoreline via hand or vehicle-mounted sprayers. Vehicles may include quad-runner type vehicles, semi-aquatic-amphibious vehicles, trucks, or other appropriate vehicles.

2.3.3.3 Application to Tributary Streams

The tributaries would be treated using drip stations, hand sprayers, vehicle-mounted sprayers, and/or boats. The vehicle-mounted sprayers could be mounted on two or four-wheel drive, quad-runner, or semi-aquatic amphibious vehicles. The application method would depend on water flow and velocity, overhanging vegetation, amount of aquatic vegetation, channel morphology, access, topography, and location in the watershed. Staging areas are shown on the project area map, Figure 2-3.

For flowing waters, drip stations would be placed at approximately 0.5 to 1 hour water travel time. Water travel time would be determined using Rhodamine WT dye or salt. Drip station placement would be outlined in a treatment plan that would follow rotenone label requirements. Cages containing live trout (i.e., live cars) would be placed immediately upstream of each application site, except the uppermost site, to ensure that lethal conditions exist between drip station (treatment) sites.

In addition to the drip stations, hand-spray crews would traverse each stream segment, treating all backwater areas, standing water areas, or large stagnant or slow flowing pool areas. If flows are very high, the additional spraying may be done from semi-aquatic quad boats that can have either wheels or tracks or other vehicles with appropriate equipment.

Gel balls consisting of a mix of sand, gelatin, and powdered rotenone may be used in areas that contain springs or seeps, standing water, or large pools, if these areas would be best treated by this method. These gel balls release a formulation of rotenone over a period of time, and would help ensure that all potential areas of escape for fish are eliminated.

Additional live cars containing trout may be placed in isolated pools or non-flowing or low flow areas to monitor rotenone concentrations and to ensure that all areas receive enough rotenone to eliminate pike.

Two strategies are proposed for ensuring that no pike are able to survive in the tributaries during treatment of the reservoir.

Strategy 1: Concurrent Treatment of Tributaries and Reservoir

Chemical treatment of the tributaries at or near their point of inflow into the reservoir would continue until the entire reservoir is treated, so that both areas would be concurrently uninhabitable to pike. Pike would be unable to avoid lethal exposure to rotenone by swimming up the creeks.

[6] 10 percent Noxfish® to volume of carrier.

Strategy 2: Fish Barriers

If concurrent treatment of the tributaries is not feasible or not the most effective method, barriers to upstream fish movement would be located, designed or constructed, as needed to prevent pike from moving up into the streams from the reservoir. When the reservoir is treated, all water from the barriers to the reservoir would be treated to help ensure that no pike survive.

2.3.3.4 Application to Standing Waters in Watershed Area

All areas of standing or flowing water would be treated. At the present time, water(s) that may be considered as potential non-treatment areas are headwater springs that contain listed threatened or endangered species, or species of concern. These areas would be reviewed on a case-by-case basis. All other waters from the headwater section of the stream down to the reservoir would be treated to eliminate any pike that may be present.

Application to Beaver Ponds

There are several beaver dams located on tributaries to Lake Davis. Freeman Creek is known to have two, while Big Grizzly Creek has at least five dams. For the Proposed Project (and other alternatives involving the use of rotenone), prior to implementation these dams would be breached slowly and manually to lower ponded water levels thereby exposing northern pike refugia and minimizing the volume of water to be treated. These dams create numerous backwater areas and isolated deep pools that would be difficult to treat. Furthermore, the beavers have dug underwater tunnels that extend several hundred feet back into the bank that must also be dewatered because they would be extremely difficult to treat. After the beaver dams are breached, a pipe or several pipes may be laid in the bottom of the stream channel through the area of the beaver dam. This may help keep the water from backing up behind the structures should the beaver rebuild the dam. However, the beaver may obstruct the flow through the pipe. In addition, because beavers have a propensity for rebuilding their dams quickly after a breach, the breached dams and any pipes would be monitored frequently and the ponds and tunnels kept dewatered through any necessary continued hand-removal of branches, leaves, and mud, until the chemical treatment is completed.

At the end of the chemical treatment, the beavers would be allowed to rebuild the dams.

2.3.3.5 Timing of Rotenone Application

Rotenone application to tributary streams and the reservoir would take place over a period of three to five weeks between mid-August and late October, months when Lake Davis water temperatures are high and the stream flows are low enough to allow for effective treatment. Rotenone is metabolized by fish more rapidly, and works more quickly as a piscicide, at higher temperatures. Timing and duration of tributary treatment would depend on the flow and continuity of tributary streams and may involve multiple treatments.

Chemical application in the tributaries could begin 7 to 10 days before treatment of the reservoir. All the tributaries would be treated before the reservoir treatment begins, starting at the headwater reaches of the streams and working in the general direction downstream to the

reservoir. When the treatment reaches the reservoir, the streams would be blocked by barriers or rotenone (see Strategy 1 and Strategy 2 above) to prevent upstream movement of fish from the reservoir. The reservoir would then be treated. When the rotenone is dispersed throughout the reservoir (one to two days later), the streams would be treated again using the same procedure listed above. The second tributary treatment is required to: (1) verify that no fish survived or were replanted in the tributaries during or after the first treatment; and (2) monitor the effectiveness of the first treatment and eliminate any fish that might have survived it.

Although unlikely, a third treatment may be required if pike are found in the tributaries during the second treatment.

2.3.3.6 Treatment Monitoring

Prior to treatment under the Proposed Project, monitoring plans would be developed with the following objectives:

- Verify that rotenone concentrations have reached levels that will kill the pike throughout the treatment area;
- Verify treatment effectiveness;
- Determine when the piscicide has biodegraded in the reservoir and the reservoir is safe for restocking of trout;
- Determine rate of re-establishment of the fishery.

Monitoring plans would include specified monitoring locations, the use of caged trout as sentinel fish, laboratory water quality monitoring, and standard fishery sampling methods.

2.3.4 Rotenone Neutralization

Neutralization of any discharge of treated water from Lake Davis into Big Grizzly Creek is proposed in order to minimize the impact of rotenone on aquatic resources downstream of Lake Davis. The Proposed Project calls for allowing the rotenone in the reservoir to degrade through natural processes following the treatment. Depending on water temperature and sunlight, the rotenone in Lake Davis is expected to break down to nontoxic products within 14 to 45 days. Higher water temperature and more sunlight speed up the breakdown process, while lower water temperature and less sunlight result in the rotenone degrading more slowly. Turbidity is also a factor in the degradation of rotenone.

To prevent release of the rotenone from Lake Davis to Big Grizzly Creek, four neutralization options have been proposed. Some of these options include treatment of discharge water with potassium permanganate. All options include reduction of the existing minimum instream flow (10 cfs) by different amounts for some period of time. See Appendix E, Draft Neutralization Options.

Potassium permanganate is a strong oxidizer commonly used to neutralize rotenone. Potassium permanganate will neutralize rotenone in 15 to 30 minutes, depending on water temperature. During oxidation, potassium permanganate is converted to manganese oxide, which is biologically harmless. Because potassium permanganate can be toxic, care must be

applied when using it to make sure the rotenone is neutralized, while minimizing the amount of excess potassium permanganate in the water. Overdosing with potassium permanganate occurred in 1992 on Silver King Creek (DFG 1994) and also occurred in Big Grizzly Creek following the 1997 treatment. This resulted in unintentional fish kills on both systems.

2.3.4.1 Option 1: Pumpback to Reservoir – No Chemical Neutralization

Option 1 calls for closing the outlet valve to eliminate all outflow except dam seepage (estimated to be approximately 4 gpm) and returns this seepage to the reservoir by means of pumps and pipes or a tanker truck. This would eliminate all flow from about a 150-yard-long section of stream immediately below the dam. Flow below this point would be provided by about 60 gallons per minute (0.15 cfs) of spring flow and additional accretion flows downstream. The outlet valve would remain closed until the rotenone in Lake Davis is neutralized by natural processes as discussed previously. Granular potassium permanganate ($KMnO_4$) would be kept at the site to neutralize any spills, leaks, or other system failures.

DWR personnel would begin decreasing flow slowly in Big Grizzly Creek for 48 to 72 hours before the rotenone application in Lake Davis begins. As the creek flow recedes, DFG personnel and persons interested in volunteering to help the DFG would capture fish in the reach of Big Grizzly Creek immediately below the dam. These fish would be moved downstream below the point where habitat is expected to be significantly affected by the decreased outflow from the dam (Rischbieter 2005). At the same time, the potassium permanganate equipment (for emergency use) would be installed and tested.

2.3.4.2 Option 2: Offstream Neutralization of Minimal Flows

Under Option 2, a neutralization station would be set up above the dam within the reservoir footprint in the vicinity of the spillway. Releases from Grizzly Valley Dam would be slowly reduced and then stopped for 5 days during and after the application of rotenone in Lake Davis. Only leakage flows (about 4 gpm from the base of the dam) would enter the creek below the dam.

Beginning on or about the sixth day, reservoir water would be pumped through screens to the neutralization station at a rate of 0.2 to 2.0 cfs. The neutralization station would neutralize rotenone with potassium permanganate ($KMnO_4$) using a system of pumps and containers. $KMnO_4$ would be applied at a rate of 2 to 4 mg/liter. Containers would be designed to allow for 30 to 60 minutes of contact time between the rotenone and potassium permanganate, allowing for thorough neutralization (see Table 1.0 in Appendix E for examples of vessel sizes needed for various flows of treated water). For flows up to about 0.5 cfs, a secondary filter system, such as granular activated charcoal (GAC), has been suggested. This could be used to remove residual rotenone formulation constituents, but would not be necessary for removing the rotenone itself. After being treated at theneutralization station, the water would be piped over the dam and down into Big Grizzly Creek, below the containment system.

Neutralization Option 2 would occur for about 14 to 45 days. The dam leakage and spring flow downstream of the dam would supplement the flow of the neutralized water in Big Grizzly Creek, below the dam.

DWR personnel would begin decreasing flow slowly in Big Grizzly Creek for 48 to 72 hours before the rotenone application in Lake Davis begins. As the creek flow recedes, DFG personnel and persons interested in volunteering to help the DFG would capture fish in the reach of Big Grizzly Creek immediately below the dam. These fish would be moved downstream below the point where habitat is expected to be affected by the decreased outflow from the dam (Rischbieter 2005). At the same time, the neutralization equipment would be installed and tested. Personnel would remain with the neutralization equipment 24 hours per day once it is placed onsite. A travel trailer and toilet facilities would be available at this location during the neutralization process.

2.3.4.3 Option 3: Flow Releases of 1 to 2 cfs with Instream Treatment with $KMnO_4$

Option 3 calls for closing the outlet valve for five days to allow thorough mixing of rotenone in the reservoir. After this time, 1 to 2 cfs would be released. The water released would be treated in the Big Grizzly Creek below Lake Davis with potassium permanganate. Monitoring of potassium permanganate would ensure that concentrations are sufficient to neutralize residual rotenone, yet below toxicity values for fish.

DWR personnel would begin decreasing flow slowly in Big Grizzly Creek for 48 to 72 hours before the rotenone application in Lake Davis begins. As the creek flow recedes, DFG personnel and persons interested in volunteering to help the DFG would capture fish in the reach of Big Grizzly Creek immediately below the dam. These fish would be moved downstream below the point where habitat is expected to be significantly affected by the decreased outflow from the dam (Rischbieter 2005). At the same time, the neutralization equipment would be installed and tested. Personnel would remain with the neutralization equipment 24 hours per day once it is placed onsite. A travel trailer and portable toilet would be set up at this location during the neutralization process.

On the day prior to the reservoir treatment, live cars containing sentinel rainbow trout would be placed between the dam and the neutralization station and at the 15-minute, 30-minute, and 60-minute downstream flow travel marks. The fish located between the dam and the neutralization site would be replenished once per day to determine that toxicity is still occurring in the release flows. Fish at the 15-minute and 30-minute marks would be checked every two to four hours and stressed, injured, or dead fish would be replaced as necessary. Fish at the 60-minute mark would be checked every six hours. These fish would allow monitoring to assure that the potassium permanganate is at the correct concentration to neutralize the rotenone. All fish would be replaced daily so that the sentinel fish are not unduly stressed by being held for prolonged periods, and any observed stress or mortality is most likely the result of rotenone or $KMnO_4$ toxicity.

The sentinel fish would be provided by a DFG hatchery and held nearby for continual restocking of the live cars throughout the duration of the neutralization operation. The live cars would contain three to five fish each. The live cars would be located in slack water areas to reduce stress.

2.3.4.4 Option 4: Flow Releases of 3 to 5 cfs with Instream Treatment with $KMnO_4$

Option 4 would be the same as Option 3, but would have a higher flow release. This option calls for closing the outlet valve for five days to allow thorough mixing of rotenone in the reservoir. After this time, 3 to 5 cfs would be released and treated in the stream with potassium permanganate. The same measures as described for Option 3 would be used to rescue fish in the neutralization zone and to verify the neutralization of rotenone and minimize the potential for overdosing the creek with potassium permanganate. The neutralization zone would be determined by flow and travel times prior to a treatment if one is approved.

2.3.5 Spill Contingency Planning

If a chemical application project is approved, a spill contingency plan would be developed prior to implementation. The plan would provide specific background information as well as staffing and procedures to prevent, and if necessary, contain and treat an accidental spill. Training in spill contingency planning and procedures would be conducted at the appropriate staff levels, and the plan would be discussed and coordinated with appropriate staff in other agencies.

Key elements of this plan include:

- Description of rotenone and permanganate products to be used;
- Physical description of materials,
  - Amounts to be stored on site,
  - Packaging of materials – including type and size of packaging,
  - Physical description,
  - MSDS and product labels;
- Transportation of products;
- Location of materials storage;
- Time period of materials storage;
- Precautions for preventing spills,
  - Storage procedures,
  - Mixing and application procedures,
  - Rinsing procedures,
  - Disposal procedures,
  - Worker education and training;
- Spill containment,
  - Physical containment plan and structures,

  - Spill containment equipment,
  - Chain of command, including local liaison,
  - Roles and responsibilities,
  - Physical procedures, including spill treatment,
  - Reporting procedures,
  - Emergency contact procedures,
  - Emergency contact information, including downstream landowners,
  - Worker training and education,
  - Availability of MSDS, product label,
  - Appropriate safety gear; and
- Site security,
  - Staffing,
  - Chain of command,
  - Roles and responsibilities,
  - Procedures.
- Communications
  - − Radio and cell phone access enhancement,
  - − Satellite phones
  - − Chain of command,
  - − Roles and responsibilities,
  - − Procedures.

2.3.6 Fish Removal and Disposal

Dead fish are not a threat to people or wildlife and actually can add nutrients back into the water to help the Lake Davis food chain rebound quickly. However, there are often concerns about odor, bacterial build-up in the fish or other issues related to the concentration of dead fish. Therefore, approximately 100 tons of fish would be retrieved, loaded into a truck, and hauled to a landfill or other approved facility.

Dead fish would be picked up as soon as they begin to appear after the rotenone is applied. Fish would be picked up from the shoreline and surface of the reservoir by boat and hand crews and from stream segments. These crews would probably be from the DFG; however they may include people from other agencies, contractors, volunteers, or other involved groups. Equipment needed may include boats, hand crews and equipment, garbage cans, gloves, quads, air boats, amphibious vehicles, dump trucks, loaders, tractors, and a variety of other types of equipment.

Fish disposal would start after the treatment of the reservoir has been completed. Fish disposal would be coordinated with appropriate agencies such as state and county health. (See Table 1.6-1 for a list of potential agency approvals and agencies that will use this EIR/EIS). Any necessary permits or approvals would be acquired before the fish are collected or taken to the disposal site.

2.3.7 Fish Restocking

If a project is approved to eradicate pike from the reservoir using chemicals, live cars containing rainbow trout would be suspended at various water depths throughout the reservoir to determine when reservoir water will support trout. Once the water has neutralized adequately to sustain trout, catchable size or larger rainbow trout would be stocked into Lake Davis at a rate of five fish per surface acre. The stocking rate, 5 versus 10 fish per surface acre, is based on the probability of a short-term reduction in the reservoir's forage base following pike eradication. In addition to immediate post eradication stocking, an additional assortment of various sized trout would be stocked in the spring following ice-out. Trout stocked in the following spring would consist of fingerling, sub-catchable, catchable and trophy (>3 pounds) sized fish, based on availability of trout. Recommended stocking rates for the various sizes of trout include: fingerlings, 230 per surface acre; sub-catchables, 50 per surface acre; catchables, 30 per surface acre; and trophy size, 0.1 per surface acre.

In addition to rainbow trout, adult brown trout (~3 pounds and greater) would be stocked in the reservoir to provide a diversified trout fishery. The recommended stocking rate for brown trout is 0.1 fish per surface acre.

Fingerling brook trout could be restocked in Freeman Creek and Cow Creek. In addition to the brook trout, fingerling rainbow trout would be stocked in Big Grizzly, Cow, and Freeman creeks.

2.3.8 Plumas National Forest Closures

Two temporary forest closure orders (referred to as closures, forest closures, or orders) are included in the Proposed Project and illustrated in Figure 2-4, Proposed Forest Closures. One closure would prohibit human entry into the previously submerged reservoir bed, as it becomes exposed with the lowering of the reservoir waters. This closure would be to protect historical and cultural artifacts from human disturbance. The second closure would prohibit human entry into National Forest System lands and roads in the vicinity of rotenone storage and application sites, including Lake Davis and tributary streams. This second closure would also apply to the no chemical treatment alternative (Alternative E). It would protect public safety during the time that intensive construction-type activity is occurring at Lake Davis and tributary streams (Dillingham 2006).

2.3.8.1 Proposed Closure 1 – Exposed Reservoir Bed

The Lake Davis reservoir was created by the flooding of Grizzly Valley. Grizzly Valley was a center of human activity for thousands of years by both native people and early settlers. All of the other valleys in the vicinity of Grizzly Valley contain a wealth of cultural artifacts.

This proposed forest closure would reduce the risk of illegal disturbance and collection of artifacts.

All of the land inside the loop road around Lake Davis is designated as the Lake Davis Recreation Area, and since the late 1970s off-road vehicular access and dispersed camping have been prohibited. This current area closure is intended to protect the scenic quality of the heavily used lands within the Recreation Area. Soils and vegetation here are slow to recover from concentrated traffic and use. Tire tracks can persist for years. Left unmanaged, the Recreation Area would quickly become a warren of roads and trails crossing the landscape, and vegetation would start to disappear, greatly reducing the scenic value of the area.

The proposed closure would prohibit the general public from walking into the exposed reservoir bed in some if not all areas. The general public would still be able to drive on developed forest roads and parking lots, use the campgrounds, picnic areas, and boat ramps, as well as walk down to the 45,000 acre-foot shoreline. The general public would not be allowed into the exposed reservoir bed below the 45,000 acre-foot shoreline. The exception to the closure would be along the southeast shore of the reservoir, between the southern loop of Grizzly Campground to the boat ramp at Honker Cove. Between these points, people could walk down to the water shoreline at 15,000 acre-feet, and could trailer boats to the water's edge, unless mud prohibited vehicle access. Human use by boating and swimming in and on the waters of the reservoir would not be affected by the closure. This closure would be in effect as long as the reservoir capacity was below 45,000 acre-feet (reference Section 2.3.1).

The forest closure would be implemented by signing, notification, and enforcement of the closure.

- Temporary signs and markers would be installed along roads, parking areas, and at the heads of access trails leading to the reservoir.
- Kiosks around the reservoir would be posted with notices of the closure.
- The public would be notified through newspaper articles, radio announcements, informational brochures, websites, campground hosts, and coordination with local communication points.

Law enforcement personnel are already accustomed to implementing the no-vehicle access forest closure in the area. Prohibiting foot traffic into the exposed reservoir bed would not be a great deviation from current enforcement practices.

Several members of the public have identified the desire to access the exposed lakebed during the winter, when snow blankets the ground. Access could be by snowmobile, skis, snowshoes, or dogsleds. Several local non-profit organizations hold winter fund-raising events in the Lake Davis area. Many members of the public have asked if snow would provide adequate protection for the cultural resources and if the forest closure to the lakebed could be suspended while the area is blanketed with snow to allow these activities to take place.

Figure 2-4 Proposed Forest Closures

Figure 2-4 BACK

The Plumas National Forest often allows snow-based activities to proceed in areas where surface disturbance of the ground is of concern. These include Forest Closure Order No. 6-89, in areas of Antelope, Butte, Round Valley, Davis, Bucks, Little Grass Valley, Frenchman, Sly Creek, and Silver Lakes Recreation Areas, as well as the Lakes Basin Recreation Area. Another example is when timber sale and service contract operators are allowed to operate machinery in areas of known cultural resources if the ground is adequately covered with snow. These measures have been effectively implemented and monitored for years.

Therefore, the Forest Supervisor may consider the suspension of this forest closure order during times of snow pack. This would allow traditional winter uses of the area to continue while still protecting cultural resources. The Law Enforcement Plan would include an assessment of enforcement needs during winter conditions.

2.3.8.2 Proposed Closure 2 – Human Health and Safety

This proposed closure for human health and safety would apply under all of the alternatives, those that involve the use of rotenone and the complete dewatering/no chemical alternative. The rotenone formulations proposed for use are classified as pesticides and in undiluted form, present an element of risk to natural and human environments. The label states that once the application has been completed, human contact with the water including swimming is allowed, but for this project any contact would be discouraged until rotenone is no longer detected in the reservoir. Although there is no public health issue requiring the restriction of contact with treated water, the DFG and USFS are taking a more cautious approach with respect to public safety.

Rotenone would be stored, transported, and applied at various sites throughout the project area. In order to prevent unplanned human exposure to the rotenone and to minimize the chance of a spill, the storage, transportation, and application of the rotenone must occur in as controlled an environment as possible, as explained below.

- To ensure safety, personnel conducting the rotenone application must be able to work without unplanned encounters with people who are not part of the operation. Unplanned human encounters could also result in the temporary shutting down of operations to provide for public safety. This would delay the efficiency of the operation, thereby potentially extending the period of time that rotenone is onsite in the project area;
- Forest visitors must be protected from coming into contact with the rotenone while it is stored, transported and applied in the waters of the project area. Unwary visitors could stumble upon a drip station, stream, or portion of the reservoir shore while rotenone is present. Not familiar with safety precautions, they would be at high risk of exposure; and
- Forest visitors driving along roads in the project area while rotenone is being transported to application sites could impede an efficient operation, or they could be exposed to airborne rotenone fumes.

The vicinity of Lake Davis would be closed to vehicle and foot traffic as long as undiluted rotenone is stored in the project area. Closure would take effect the day before the rotenone

arrives by truck at the storage site. The following closures would be in effect as long as rotenone was onsite:

- All of the roads leading into and through the project area would be closed:
  - The west side reservoir road, 24N10 and its spur roads, beginning at its junction with County Road 126 (west road);
  - The east side reservoir road, County Road 112 and its spur roads, from its junction with County road 126, near the dam;
  - Forest Road 23N10 and its spur roads, which lead into the project area from the north, via Bagley Pass;
  - County Road 112 and its spurs leading into the project area from the west, via Summit Marsh; and
  - Forest Road 24N12, Threemile Valley Road, and its spurs leading into the project area from southwest.
- Human entry to National Forest System lands, including developed campgrounds as well as undeveloped areas within the area proscribed by connecting the road junctions described above, would be prohibited.

Exceptions to the area and road closures would include:

- Private landowners who cannot access their property via detour;
- Emergency response vehicles;
- Personnel identified as necessary to the pike eradication operation;
- Persons operating under contract to or permit by the USFS, who are specifically identified in the hazard management plan as allowed within the project area; and
- Staff essential to the operation and maintenance of the Smith Peak fire lookout.

These existing roads would be identified as detour routes around the project area during this forest closure:

- Road 24N06, the Crocker Cutoff, leading from Grizzly Road east to the Crocker Meadow and Red Clover Valley areas; and
- Road 25N90, through Red Clover Valley to the north of the project area.

After unused rotenone is transported out of the project area, treated streams and reservoir waters would be monitored for persistence of rotenone. As rotenone dissipates from aquatic environments, it is anticipated that some roads in the project area could safely be opened for public use before others. This would most likely be along the western edge of the reservoir, where running streams should quickly flush rotenone downstream, away from the roads. This would open up the west side road, 24N10, and County Road 112 from its intersection with road 23N10 (Bagley Pass Road) west out of the project area toward Walker Mine and Genesee Valley. The east side road, County Road 112, would likely be the last major road opened to public use. All spur roads leading down to the reservoir edge and the area between

the loop road and the reservoir would remain closed, until reservoir waters were determined not to be a human health risk.

Depending on how efficiently a rotenone application could proceed, and on how quickly the rotenone formulation dissipates, the total road and area closure is anticipated to be in effect for approximately three to five weeks before a phased-in opening. The area and roads within the loop road would remain closed the longest; until winter ice-over in the longest scenario.

Road closures would be carried out by barricading and signing roads, staffing busier intersections during peak traffic periods, and engaging in intensive public notification and enforcement of the closure.

- Temporary signs and maps would be installed along roads, parking areas, and at trail head accesses leading to the closed areas;
- Kiosks around the reservoir would be posted with advanced notices of the upcoming closure; and
- The public will be notified through advanced newspaper articles, radio announcements, informational brochures, websites, campground hosts, and coordination with local communication points.

Interagency law enforcement coordination would be required to ensure consistent and accurate implementation of the closure orders.

2.4 Alternative A – 15,000 Acre-Feet (Plus Treatment Including Powder)

Alternative A is similar to the Proposed Project except a powdered form of rotenone (Cube Powder Fish Toxicant®) would be used in the reservoir, and liquid rotenone (Noxfish® or CFT Legumine®) would be applied to the tributary streams, pools, ponds, or springs in the watershed that could contain pike. Alternative A was selected to evaluate the use of powdered rotenone, which has a different chemical composition from liquid rotenone and no potential for odor. However, the use of powdered rotenone creates more of a hazard for applicators and resources needed for applicator safety and does not disperse as readily in water as the liquid formulations.

The proposed features for Alternative A are presented in Table 2.4-1.

2.4.1 Reservoir Drawdown and Refill

Drawdown and refill is the same as the Proposed Project (reference Section 2.3.1).

2.4.2 Rotenone Formulations, Concentrations, and Quantity

Treatment of Lake Davis under Alternative A would require approximately 40,500 pounds of the Cube Powder Fish Toxicant® to achieve the same concentration of rotenone as the Proposed Project. The powdered form has no odor.

To implement this alternative, large quantities, (approximately 40,550 pounds) of Cube Powder Fish Toxicant® powder would be mixed into a slurry with water. All personnel in the vicinity of the mixture would be required to wear personal protective equipment as described

on the Cube Powder Fish Toxicant® label. This alternative would require more personnel (to participate in the mixing and transport to the boats) than the Proposed Project.

The liquid Noxfish® or CFT Legumine® would be used in the tributaries rather than the powdered form, as the powdered form is not labeled for use in stream environments, except immediately upstream of reservoirs. A maximum of 260 gallons of rotenone would be required at 27 drip stations to treat the 34 miles of stream. The procedures and equipment needed are described under the Proposed Project.

2.4.3 Treatment

This section describes the proposed treatment (application procedures and timing) that would be implemented if this is the selected alternative. Detailed technical plans would be designed after any project approval following completion of the environmental review process under CEQA and NEPA in order to allow consideration of any environmental concerns raised

Table 2.4-1. Features for Alternative A

Features	Alternative A
Description	Lower reservoir to 15,000 acre-feet and treat with liquid and powdered rotenone
Reservoir surface elevation	5,749
Miles of stream	34
Approximate standing water surface area (acres)	1,331
Treatment	
Reservoir treatment volume (acre-feet)	15,000
Time to Drawdown[1]: Number of years treatment volume target is predicted to be reached by 1st of target month in 38 years modeled without supplemental pumping; numbers in parentheses are the number of years treatment volumes could be reached with supplemental pumping.[1]	Aug 1: 21 (27)
	Sept 1: 27 (34)
	Oct 1: 34 (36)
Time to refill (months) to 45,000 acre-feet	5 to 79 months 75% likelihood of refill by 21 months post-treatment
Type of Treatment	
Agent	Cube Powder Fish Toxicant® (Powder) in reservoir and Noxfish® or CFT Legumine® (liquid) in streams
Estimated rotenone amount-reservoir	40,541 pounds
Estimated rotenone amount-streams [2]	260 gallons
Estimated number of drip stations[2]	27
Access and Staging	
Reservoir staging locations	Primary: Honker Cove Boat Launch Area Potential Additional: Camp 5 Boat Launch Area Mallard Cove Boat Launch.

Table 2.4-1. Features for Alternative A

Features	Alternative A
Stream staging locations	Indicated on Figure 2-3
Staging area (acres)	<5
DFG reservoir access locations (ramp sites)	Honker Cove Camp 5 Mallard Cove
DFG access routes to streams and springs	General access would be by vehicle along existing roads. Other access will be by foot traffic and/or off-highway vehicles (OHVs). Use of OHVs would be determined during season prior to application and in consultation with the USFS. Routes dependent on runoff situation.
Fossil-fueled Equipment (Hours of Use)	
Helicopter	0
Watercraft	1,500
Vehicles	6,000
Pumps (dewatering tributaries & reservoir)	0
Pumps (potential supplemental pumps to dewater reservoir)	0–2,184
Pumps (rotenone application)	400

Notes:

1. Time to Drawdown: The frequency of years in which the target treatment volumes would be achieved by the 1st of the indicated month. Calculation of this value is based on reservoir inflow and elevations in years from 1967 through 2004 (38 years). In these calculations, it is assumed that the starting volume of the reservoir is 45,000 acre-feet on January 1 of the year of treatment. The number in parentheses indicates the number assuming supplemental pumping is employed. Pumping is based on a pumping rate of 75 cfs during the months of April, May, and September. No pumping is assumed to occur during June through August to accommodate downstream recreation. These probabilities do not include any additional flow reductions for downstream users. If such reductions are made, an additional 600 acre-feet would remain in the reservoir for every 1 month of 10 cfs reduction. If flow was reduced by 100 cfs for two months (mid-June to mid-August, an additional 12,000 acre-feet would remain in the reservoir on September 1.
2. Stream treatment assumptions: 10 cubic feet per second total streamflow, drip stations every 0.5 mile on main tributaries and two back-to-back stream treatments.

during that process and any resulting conditions of approval. These detailed technical plans would be more able to anticipate actual on-the-ground conditions at the time of treatment. The treatment would be managed under an Incident Command System (ICS) structure involving appropriate Federal, State, and local agencies, and would be implemented in compliance with applicable Federal, State, and local laws and regulations, including, but not necessarily limited to, label requirements and Occupational Safety and Health Administration (OSHA) regulations. Boat access would be similar to that described in Section 2.3.3.

2.4.3.1 Application to Open Water

The reservoir would be treated with Cube Powder Fish Toxicant® applied from boats, to achieve a concentration of 1 ppm. The reservoir would be divided into areas and the water volume in each determined. Once the amount of rotenone needed to reach 1 ppm in a given

area is calculated, an applicator crew (consisting of a boat, pilot, and applicator) would be assigned to pump that amount into each area. The rotenone would be applied within an estimated time frame of up to 72 hours (three days) to reach the prescribed levels of the pesticide at one time in the entire reservoir.

Resulting rotenone effectiveness would be gauged by placing cages containing live rainbow trout in pre-determined locations at predetermined depths throughout Lake Davis. Rainbow trout are less sensitive to rotenone than are pike; rainbow trout have a 24-hour LC_{50} of 3.4 μg/L, meaning that half of the fish are dead within 24 hours when rotenone is at a concentration of 3.4 μg/L, as compared to pike, which have a 24-hour LC_{50} of 2.2 μg/L. Therefore, trout can serve as sentinels to indicate that sufficient toxicity to kill pike is present throughout the reservoir.

2.4.3.2 Application to Shoreline Areas

Just as with the Proposed Project, the shoreline area would be treated from boats and possibly air boats, using a low pressure spray of up to 10 percent volume to volume rotenone. The littoral zone of the reservoir (near shallow and inaccessible weed beds) would be treated using shallow draft boats with a jet motor, air boats, or other appropriate methods, such as spraying from the shoreline via hand or vehicle mounted sprayers. Vehicles may include quad-runner type vehicles, Argos (semi-aquatic amphibious vehicles), trucks, or other appropriate vehicles.

2.4.3.3 Application to Tributary Streams

Treatment would be the same as for the Proposed Project. The tributaries would be treated using drip stations, hand sprayers, vehicle-mounted sprayers, and/or boats. The vehicle-mounted sprayers could be mounted on four-wheel drive, quad-runner, or semi-amphibious vehicles. The application method would depend on water flow and velocity, overhanging vegetation, amount of aquatic vegetation, channel morphology, access, topography, and location in the watershed.

2.4.3.4 Application to Standing Waters in Watershed Area

Treatment would be the same as for the Proposed Project. All areas of standing or flowing water could be treated.

2.4.3.5 Timing of Rotenone Application

Timing of the rotenone application would be similar to the Proposed Project. Rotenone application to tributary streams and the reservoir would take place over a period of up to three to five weeks between mid-August and late October, during months when Lake Davis water temperatures are high and the stream flows are low enough to allow for an effective treatment.

2.4.4 Rotenone Neutralization

Neutralization of any treated water discharged from Lake Davis into Big Grizzly Creek is proposed in order to minimize the impact of rotenone on aquatic resources downstream of Lake Davis, consistent with the options described under the Proposed Project. These neutralization options are the same as for the Proposed Project. The four neutralization options are described in Section 2.3.4.

2.4.5 Plumas National Forest Closures

There are two forest closures proposed; these are the same as described for the Proposed Project in Section 2.3.8. A special use permit would be issued to the DFG by the PNF.

2.5 Alternative B – 5,000 Acre-Feet (Plus Treatment)

Under Alternative B the reservoir would be drawn down to 5,000 acre-feet and liquid Noxfish® or CTF Legumine® would be applied throughout the reservoir; to tributary streams; and to any pools, ponds, or springs in the watershed potentially containing pike. At a volume of 5,000 acre-feet, the surface elevation of Lake Davis is about 5,738 feet and the surface area is about 550 acres. The project would commence with reservoir drawdown beginning in January 2007, followed by rotenone application between mid-August and late October of 2007. Alternative B was selected for evaluation because it would use a minimal amount of rotenone as compared to the other alternatives involving the use of rotenone.

The proposed features for Alternative B are presented in Table 2.5-1.

2.5.1 Reservoir Drawdown and Refill

2.5.1.1 Drawdown

Table 2.5-1 provides the number of years the reservoir would reach the target volume by August 1, September 1, and October 1. The August 1 number is provided for reference only, since a treatment would not begin before mid-August. Without supplemental pumping, the DFG model (Appendix D) predicts that the reservoir would be at or below 5,000 acre-feet in 14 of 38 years by August 1, in 21 of 38 years by September 1, and in 26 of 38 years by October 1. Assuming supplemental pumping of 75 cfs was employed in April, May, and September, the target elevation would be reached in 21 of 38 years by August 1, 26 of 38 years by September 1, and 34 of 38 years by October 1. Outflow may be constrained during some periods by the needs of downstream water users. Although these constraints have not been incorporated into the model output, they are addressed in the affected resource sections such as recreation, and public services (water rights). If flows are reduced to accommodate concerns of downstream users on Big Grizzly Creek, the volume of water in the reservoir would be greater on the August to October target dates. The analyses throughout this document address the impacts of the stated treatment levels, and do not incorporate outflow restrictions.

2.5.1.2 Refill

The amount of time to refill the reservoir cannot be determined precisely at this time because it would depend on operational and climactic conditions. Accordingly, the likely rate of refilling the reservoir is predicted based on historical conditions as follows. Refilling Lake Davis from 5,000 acre-feet to 45,000 acre-feet, based on the years of record, would require 6 to 80 months. In 10 of 32 of the water years of record (31 percent), the reservoir would have refilled to 45,000 acre-feet by June 1 of the year following treatment. The reservoir would have refilled to 45,000 acre-feet by the following June (second year following treatment) in 19 of 32 the water years of record (59 percent). In 24 of 32 water years of record (75 percent), the reservoir would have refilled within 38 months.

Table 2.5-1. Features for Alternative B

Features	Alternative B
Description	Lower reservoir to 5,000 acre-feet and treat with liquid rotenone
Reservoir surface elevation	5,738
Miles of stream	38
Approximate standing water surface area (acres)	545
Treatment	
Reservoir treatment volume (acre-feet)	5,000
Time to Drawdown[1]: Number of years treatment volume target is predicted to be reached by the identified date in 38 years modeled without supplemental pumping; numbers in parentheses are the number of years treatment volumes could be reached with supplemental pumping.[1]	Aug 1: 14 (21)
	Sept 1: 21 (26)
	Oct 1: 26 (34)
Time to refill (months) to 45,000 acre-feet	6 to 80 months 75% likelihood of refill by 39 months post-treatment
Type of Treatment	
Agent	Noxfish® or CFT Legumine® (liquid) plus gel balls from powder (possible)
Estimated rotenone amount-reservoir	1,667 gallons
Estimated rotenone amount-streams [2]	275 gallons
Estimated number of drip stations[2]	35
Access and Staging	
Reservoir staging locations	Primary: Honker Cove Boat Launch Area Potential Additional: Camp 5 Boat Launch Area Mallard Cove Boat Launch
Stream staging locations	Indicated on Figure 2-3.
Staging area (acres)	<5

Table 2.5-1. Features for Alternative B

Features	Alternative B
DFG reservoir access locations (ramp sites)	Honker Cove Camp 5 Mallard Cove
DFG access routes to streams and springs	General access would be by vehicle along existing roads. Other access will be by foot traffic and/or off-highway vehicles (OHVs). Use of OHVs would be determined during season prior to application and in consultation with the USFS. Routes dependent on runoff situation
Fossil-fueled Equipment (hours of use)	
Helicopter	0
Watercraft	1,000
Vehicles	6,000
Pumps (dewatering tributaries and reservoir)	0
Pumps (potential supplemental pumps to dewater reservoir)	0-2,184
Pumps (rotenone application)	180

Notes:

1. Time to Drawdown: The frequency of years in which the target treatment volumes would be achieved by the 1st of the indicated month. Calculation of this value is based on reservoir inflow and elevations in years from 1967 through 2004 (38 years). In these calculations, it is assumed that the starting volume of the reservoir is 45,000 acre-feet on January 1 of the year of treatment. The number in parentheses indicates the number assuming supplemental pumping is employed. Pumping is based on a pumping rate of 75 cfs during the months of April, May, and September. No pumping is assumed to occur during June through August to accommodate downstream recreation. These probabilities do not include any additional flow reductions for downstream users. If such reductions are made, an additional 600 acre-feet would remain in the reservoir for every 1 month of 10 cfs reduction. If flow was reduced by 100 cfs for two months (mid-June to mid-August, an additional 12,000 acre-feet would remain in the reservoir on September 1.
2. Stream treatment assumptions: 10 cubic feet per second total streamflow, drip stations every 0.5 mile on main tributaries and two back-to-back stream treatments

2.5.2 Rotenone Formulations, Concentrations, and Quantity

Under Alternative B, the rotenone formulations and concentrations are the same as the Proposed Project, but approximately 1,667 gallons of liquid rotenone would be needed to treat the reservoir and 275 gallons for the streams. See Section 2.3.2 for a description of rotenone formulations, concentrations, and quantity.

2.5.3 Treatment

The treatment for Alternative B would be similar to the Proposed Project, although the volume of water to be treated is substantially less (only 5,000 acre-feet). See Section 2.3.3 for a description of the proposed treatment including boat access.

2.5.4 Rotenone Neutralization

Neutralization would be similar to the Proposed Project. However, less rotenone would require less neutralization material. See Section 2.3.4 for a description of the four neutralization options.

2.5.5 Plumas National Forest Closures

There would be two forest closures as described for the Proposed Project in Section 2.3.8. A special use permit would be issued to the DFG by the PNF.

2.6 Alternative C – 35,000 Acre-Feet (Plus Treatment)

Under Alternative C, the reservoir would be drawn down to 35,000 acre-feet and liquid rotenone would be applied throughout the reservoir, to tributary streams, and to any pools, ponds, or springs in the watershed potentially containing pike. The main differences between Alternative C and the Proposed Project and Alternatives A and B are: the amount of time required for drawdown, the resulting reservoir size (both surface area and volume), the length of the tributary streams to be treated, the resulting amount of rotenone required, and the project duration, which includes the time from commencement of drawdown, through the treatment period, until Lake Davis is refilled to a 45,000 acre-foot level. At a volume of 35,000 acre-feet, the surface elevation of Lake Davis is about 5,760 feet and the surface area is about 2,439 acres.

The proposed features for Alternative C are presented in Table 2.6-1.

2.6.1 Reservoir Drawdown and Refill

2.6.1.1 Drawdown

Table 2.6-1 provides the number of years the reservoir would reach the target volume by August 1, September 1, and October 1. The August 1 number is provided for reference only, since a treatment would not begin before mid-August. Without supplemental pumping, the DFG model (Appendix D) predicts that the reservoir would be at or below 35,000 acre-feet in 34 of 38 years by August 1, in 36 of 38 years by September 1, and in 37 of 38 years by October 1. Assuming supplemental pumping of 75 cfs were employed in April, May, and September, the target elevation would be reached in 36 of 38 years by August 1, 38 of 38 years by September 1, and 38 of 38 years by October 1. Outflow may be constrained during some periods by the needs of downstream water users. Although these constraints have not been incorporated into the model output, they are addressed in the affected resource sections such as recreation, and public services (water rights). If flows are reduced to accommodate concerns of downstream users on Big Grizzly Creek, the volume of water in the reservoir would be greater on the August to October target dates. The analyses throughout this document address the impacts of the stated treatment levels, and do not incorporate outflow restrictions.

2.6.1.2 Refill

The amount of time to refill the reservoir cannot be determined precisely at this time because it would depend on operational and climactic conditions. Accordingly, the likely rate of refilling the reservoir is predicted based on historical conditions as follows. Refilling Lake Davis from 35,000 acre-feet to 45,000 acre-feet, based on the years of record, would require 2 to 79 months. During 70 percent of the water years, the reservoir would have refilled to 45,000 acre-feet by June 1 of the following year. During 84 percent of the water years, the reservoir would have refilled to 45,000 acre-feet within 19 months (May of the second year after treatment).

Table 2.6-1. Features for Alternative C

Features	Alternative C
Description	Lower reservoir to 35,000 acre-feet and treat with liquid rotenone
Reservoir surface elevation	5,759
Miles of stream	32
Approximate standing water surface area (acres)	2,439
Treatment	
Reservoir treatment volume (acre-feet)	35,000
Time to Drawdown[1]: Number of years treatment volume target is predicted to be reached by the identified date in 38 years modeled without supplemental pumping; numbers in parentheses are the number of years treatment volumes could be reached with supplemental pumping.[1]	Aug 1: 34 (36)
	Sept 1: 36 (38)
	Oct 1:37 (38)
Time to refill (months) to 45,000 acre-feet	2 to 79 months 75% likelihood of refill by 19 months post-treatment
Type of Treatment	
Agent	Noxfish® or CFT Legumine® (liquid) plus gel balls from powder (possible)
Estimated rotenone amount-reservoir	11,667 gallons
Estimated rotenone amount-streams[2]	230 gallons
Estimated number of drip stations[2]	24
Access and Staging	
Reservoir staging	Primary: Honker Cove Boat Launch Area Potential Additional: Camp 5 Boat Launch Area Mallard Cove Boat Launch.
Stream staging locations	Indicated on Figure 2-3
Staging area (acres)	<5
DFG reservoir access locations (ramp sites)	Honker Cove Camp 5 Mallard Cove

Table 2.6-1. Features for Alternative C

Features	Alternative C
DFG access routes to streams and springs	General access would be by vehicle along existing roads. Other access will be by foot traffic and/or off-highway vehicles (OHVs). Use of OHVs would be determined during season prior to application and in consultation with the USFS. Routes dependent on runoff situation
Fossil-fueled Equipment (hours of use)	
Helicopter	0
Watercraft	2,500
Vehicles	6,000
Pumps (dewatering tributaries and reservoir)	0
Pumps (potential supplemental pumps to dewater reservoir)	0-2,184
Pumps (rotenone application)	400

Notes:

1. Time to Drawdown: The frequency of years in which the target treatment volumes would be achieved by the 1st of the indicated month. Calculation of this value is based on reservoir inflow and elevations in years from 1967 through 2004 (38 years). In these calculations, it is assumed that the starting volume of the reservoir is 45,000 acre-feet on January 1 of the year of treatment. The number in parentheses indicates the number assuming supplemental pumping is employed. Pumping is based on a pumping rate of 75 cfs during the months of April, May, and September. No pumping is assumed to occur during June through August to accommodate downstream recreation. These probabilities do not include any additional flow reductions for downstream users. If such reductions are made, an additional 600 acre-feet would remain in the reservoir for every 1 month of 10 cfs reduction. If flow was reduced by 100 cfs for two months (mid-June to mid-August, an additional 12,000 acre-feet would remain in the reservoir on September 1.
2. Stream treatment assumptions: 10 cubic feet per second total streamflow, drip stations every 0.5 mile on main tributaries and two back-to-back stream treatments.

2.6.2 Rotenone Formulations, Concentrations, and Quantity

Under Alternative C, the rotenone formulations and concentrations are the same as the Proposed Project, but an estimated 11,667 gallons of rotenone would be needed for the reservoir. However, only 32 miles of stream would need to be treated (approximately 230 gallons). See Section 2.3.2 for a description of rotenone formulations, concentrations, and quantity.

2.6.3 Treatment

The treatment for Alternative C would be similar to the Proposed Project, although the volume of water to be treated is substantially greater (35,000 acre-feet) with a larger surface area (2,439 acres). See Section 2.3.3 for a description of the proposed treatment including boat access.

2.6.4 Rotenone Neutralization

Neutralization would be similar to the Proposed Project. With more rotenone required for treatment, more neutralization material would be needed. See Section 2.3.4 for a description of four neutralization options.

2.6.5 Plumas National Forest Closures

There would be a forest closure as described for the Proposed Project in Section 2.3.8. A special use permit would be issued to the DFG by the PNF.

2.7 Alternative D – 48,000 Acre-Feet (Plus Treatment)

Under Alternative D, the reservoir would be at 48,000 acre-feet and liquid rotenone would be applied throughout the reservoir, to tributary streams, and to any pools, ponds, or springs in the watershed potentially containing pike. Alternative D differs from the above alternatives in the amount of time required for drawdown, the resulting surface area and volume of the reservoir, the length of the tributary streams to be treated, the resulting amount of rotenone required, and the project duration, (time from commencement of drawdown through the treatment period). Because a volume of 48,000 acre-feet would be maintained, no drawdown or refill operations would be required. At a volume of 48,000 acre-feet, the surface elevation of Lake Davis is about 5,764 feet, and the surface area is about 2,936 acres. Alternative D would permit full boat access to the reservoir, as boat ramps would be functional. It is similar to the level of the reservoir for the previous treatment in 1997. Treating the reservoir at this volume has the highest probability of being accomplished in all water years by August 1.

The proposed features for Alternative D are presented in Table 2.7-1.

2.7.1 Reservoir Drawdown and Refill

2.7.1.1 Drawdown

No drawdown would be required under this alternative. The reservoir would be managed to the 48,000 acre-foot level at the start of treatment.

2.7.1.2 Refill

Under this alternative, the reservoir would not have to refill to make it accessible to launching trailered boats. The level of the treatment would be above 45,000 acre-feet, which is the level required in order to launch boats from all existing ramps at the reservoir.

2.7.2 Rotenone Formulations, Concentrations, and Quantity

Under Alternative D, the rotenone formulations and concentrations are the same as the Proposed Project; however approximately 16,000 gallons of liquid rotenone would be required to treat the 48,000 acre-feet reservoir volume. Only 30 miles of stream would need to be treated (200 gallons). See Section 2.3.2 for a description of rotenone formulations, concentrations, and quantity.

2.7.3 Treatment

For Alternative D, the treatment would be modified to cover 48,000 acre-feet of water and a surface area of 2,936 acres. See Section 2.3.3 for a description of the proposed treatment.

Table 2.7-1. Features for Alternative D

Features	Alternative D
Description	Lower reservoir to 48,000 acre-feet and treat with liquid rotenone
Reservoir surface elevation	5,764
Miles of stream	30
Approximate standing water surface area (acres)	2,936
Treatment	
Reservoir treatment volume (acre-feet)	48,000
Time to Drawdown[1]: Number of years treatment volume target is predicted to be reached by the identified date in 38 years modeled without supplemental pumping; numbers in parentheses are the number of years treatment volumes could be reached with supplemental pumping.[1]	No drawdown required
Time to refill (months)	No refill required
Type of Treatment	
Agent	Noxfish® or CFT Legumine® (liquid) plus gel balls from powder (possible)
Estimated rotenone amount-reservoir	16,000 gallons
Estimated rotenone amount-streams [2]	200 gallons
Estimated number of drip stations[2]	21
Access and staging	
Reservoir staging locations	Primary: Honker Cove Boat Launch Area Potential Additional: Camp 5 Boat Launch Area Mallard Cove Boat Launch.
Stream staging locations	Indicated on Figure 2-3
Staging area (acres)	<5
DFG reservoir access locations (ramp sites)	Honker Cove Camp 5 Mallard Cove
DFG access routes to streams and springs	General access would be by vehicle along existing roads. Other access will be by foot traffic and/or off-highway vehicles (OHVs). Use of OHVs would be determined during season prior to application and in consultation with the USFS. Routes dependent on runoff situation

Table 2.7-1. Features for Alternative D

Features	Alternative D
Fossil-fueled Equipment (hours of use)	
Helicopter	0
Watercraft	2,500
Vehicles	6,000
Pumps (dewatering tributaries and reservoir)	0
Pumps (potential supplemental pumps to dewater reservoir)	0–2,184
Pumps (rotenone application)	600

Notes:

1. Assuming the reservoir would be at approximately 45,000 acre-feet of storage in January, there would be fluctuations based on inflows and subsequent outflows, but the reservoir would be at 48,000 acre-feet prior to treatment.
2. Stream treatment assumptions: 10 cubic feet per second total streamflow, drip stations every 1 to 2 miles travel time on main tributaries and two back-to-back stream treatments.

2.7.4 Rotenone Neutralization

Neutralization would be similar to the Proposed Project. With more rotenone required for treatment, more neutralization material would be needed. See Section 2.3.4 for a description of proposed neutralization.

2.7.5 Plumas National Forest Closures

Only one forest closure to protect human health and safety as described for the Proposed Project in Section 2.3.8.2 would be proposed. The closure of the reservoir bottom to protect historical and cultural values would not be necessary since Lake Davis would not be drawn down below the 45,000 acre-foot level. A special use permit would be issued to the DFG by the PNF.

2.8 Alternative E – Dewater Reservoir and Tributaries (No Chemical Treatment)

Under Alternative E, the eradication of pike from Lake Davis would be accomplished without chemicals by completely draining the reservoir and all water sources flowing into it. Any water-filled depressions within the reservoir footprint, stream channels, overflow areas, or other standing water areas would be drained. These systems would be kept dry long enough to ensure that all pike were eliminated. Under this alternative, no piscicides would be used, and there would be no potential risks from rotenone to human health and the environment, including terrestrial species. Other risks of dewatering to terrestrial and aquatic species are analyzed in this document.

The proposed features for Alternative E are presented in Table 2.8-1.

Table 2.8-1. Features for Alternative E

Features	Alternative E
Description	Completely drain reservoir and dewater all tributary waters
Reservoir surface elevation	5,700
Miles of stream	44
Approximate standing water surface area (acres)	0
Treatment	
Reservoir treatment volume (acre-feet)	Dewater
Time to Drawdown[1]: Number of years treatment volume target is predicted to be reached by the identified date in 38 years modeled without supplemental pumping; numbers in parentheses are the number of years treatment volumes could be reached with supplemental pumping.	Aug 1: 10 (16)
	Sept 1: 17 (21)
	Oct 1: 21 (29)
Time to refill (months) to 45,000 acre-feet	6 to 80 months 75% likelihood of refill by 41 months post-treatment
Type of Treatment	
Agent	None
Estimated Rotenone amount-reservoir	None
Estimated Rotenone amount-streams[2]	None
Estimated number of drip stations[2]	None
Access and Staging	
Reservoir staging	Primary: Honker Cove Boat Launch Area Potential Additional: Camp 5 Boat Launch Area Mallard Cove Boat Launch. Additionally the DWR site at the dam and the cove near the spillway may be used as staging areas
Stream staging	4 staging areas
Area (acres)	<5
DFG Access to reservoir (ramp sites)	Honker Cove, Camp 5, and Mallard Cove
DFG Access to streams and springs	Primary access would be along existing roads. Vehicular access needed for pump and pipe deliver and installation. Use of vehicles off-road would be determined during year of project and in consultation with the USFS. Routes dependent on runoff situation.
Fossil-fueled Equipment (hours of use)	
Helicopter	20
Watercraft	900
Vehicles	7,600

Table 2.8-1. Features for Alternative E

Features	Alternative E
Pumps (dewatering tributaries and reservoir)	8,000
Pumps (potential supplemental pumps to dewater reservoir)	0
Pumps (rotenone application)	0

Notes:

1. Time to Drawdown: The frequency of years in which the target treatment volumes would be achieved by the 1st of the indicated month. Calculation of this value is based on reservoir inflow and elevations in years from 1967 through 2004 (38 years). In these calculations, it is assumed that the starting volume of the reservoir is 45,000 acre-feet on January 1 of the year of treatment. The number in parentheses indicates the number assuming supplemental pumping is employed. Pumping is based on a pumping rate of 75 cfs during the months of April, May, and September. No pumping is assumed to occur during June through August to accommodate downstream recreation. These probabilities do not include any additional flow reductions for downstream users. If such reductions are made, an additional 600 acre-feet would remain in the reservoir for every 1 month of 10 cfs reduction. If flow was reduced by 100 cfs for two months (mid-June to mid-August, an additional 12,000 acre-feet would remain in the reservoir on September 1.

2.8.1 Reservoir Drawdown and Refill

2.8.1.1 Drawdown

The probability that the reservoir could be drained by August 1, September 1, and October 1 was evaluated using the DFG drawdown/refill model (Appendix D). Without supplemental pumping, the model predicts that the reservoir could be drained in 10 of 38 years by August 1, in 17 of 38 years by September 1, and in 21 of 38 years by October 1. Assuming supplemental pumping of 75 cfs were employed in April, May, and September, the target elevation would be reached in 16 of 38 years by August 1, 21 of 38 years by September 1, and 29 of 38 years by October 1. Outflow may be constrained during some periods by the needs of downstream water users. Although these constraints have not been incorporated into the model output, they are addressed in the affected resource sections such as recreation and public services (water rights). If flows are reduced to accommodate concerns of downstream users on Big Grizzly Creek, the volume of water in the reservoir would be greater on the August to October target dates. The analyses throughout this document address the impacts of the stated treatment levels, and do not incorporate outflow restrictions.

2.8.1.2 Refill

Refilling Lake Davis from 0 to 45,000 acre-feet, based on the years of record, would require from 6 to 80 months. In 4 of 32 of the water years of record (13 percent), the reservoir would have refilled to 45,000 acre-feet by June 1 of the following year after dewatering. The reservoir would have refilled to 45,000 acre-feet by June of the second year following dewatering in 18 of 32 of the water years of record (56 percent). During 69 percent (22 of 32 years) of the water years of record, the reservoir would have refilled by June of the third season following drawdown. In 26 of 32 of the years (81 percent), the reservoir would have refilled by June of the fourth season following drawdown.

2.8.2 Dewatering

The primary components of Alternative E include draining the reservoir, draining the tributaries, and draining isolated pockets of water, such as springs, seeps, and potholes.

Water from each perennial stream would be diverted segment-by-segment sequentially to areas downstream. Isolated stream reaches would be dewatered using pumps, and the flow diverted using pipes but without moving pike with the water. Measures such as screening would be utilized to keep pike from moving into the pipe or previously dewatered stream reaches. All springs and seeps within an isolated stream segment would have to be dewatered at the same time to ensure that the pike could not move into refugia and thereby survive.

2.8.2.1 Draining Reservoir

Lake Davis would be drained using a combination of the existing reservoir outlet works and large capacity pumps. While most of the water in the reservoir would be drained through the outlet works, during periods following a wet winter with high tributary inflows, the outlet may not have sufficient capacity to fully drain the reservoir down to the dead pool level (i.e., that portion of the reservoir which is below the lowest outlet) and auxiliary pumping would be required. Pumps would also be required to drain the reservoir dead pool and to drain any pools created by depressions in the reservoir that would not drain out by gravity flow. Vehicles would be needed to access and maintain the pumps in the reservoir footprint. The type of vehicle used would depend on the size and location of the pumps and reservoir bottom conditions.

2.8.2.2 Draining Tributary Streams

Based on a visual estimate from USGS quadrants, it is estimated that there are about 44 miles of streams, including the main tributaries and their sub-tributaries that would need to be dewatered.

Each tributary stream would be evaluated to determine its runoff characteristics and would be classified as perennial, intermittent, or ephemeral. The ephemeral streams would be field surveyed, documented as dry, and would require no further action. Streams that are typically intermittent would be evaluated for their potential to dry completely by August 1 of the project year. If a stream has a high probability of drying completely by August 1, the stream would be treated as ephemeral and would be monitored to ensure that it actually does dry up. If it were determined that the stream flow might persist beyond August 1, the stream would be treated as a perennial stream.

Big Grizzly Creek (and its tributaries including Old House Creek), Freeman Creek, and Cow Creek are all considered to be primary perennial creeks and may flow throughout the year. Additionally, other tributaries to those primary perennial creeks or to Lake Davis may be designated as perennial, based on the flow characteristics of the stream during the project year. Perennial tributary streams would be divided into segments, which would be isolated and sequentially pumped dry from upstream to downstream.

The perennial and intermittent streams that could support pike populations would be treated from their upstream limit of water to their confluence with the reservoir. Beginning upstream

and working downstream, sections of the streams would be isolated using cofferdams. In each section, a cofferdam would divert the stream flow into a bypass pipe down to a second cofferdam at the pipe's discharge end. The length of each isolated stream section would vary from a few hundred feet up to one thousand feet, depending on conditions in the stream channel. The cofferdams would be made of sand bags and plastic sheeting. The bypass would be made of plastic pipe ranging up to 18 inches in diameter, depending on stream flow. The maximum flow capacity of the bypass would be approximately two cfs for a 12-inch-diameter pipe to 5 cfs for an 18-inch-diameter pipe. The bypass pipe would require a barrier device to prevent pike from passing through the pipe. Once the stream flow has been diverted into the pipe, all the remaining water in the isolated stream reach would be pumped out and discharged to the downstream channel, using about 3.5 to 5 hp gas engine pumps or electric pumps powered with gas engine generators. All vegetation would have to be cleared from the stream channel to allow for visual inspection of all wetted portions of the channel to ensure that no pockets of water remained.7 Once an isolated stream reach has been verified to be free of pike, the next downstream reach would be isolated in the same manner and flow restored to the upstream reach.

The cofferdam and dewatering sequence is anticipated to be as follows: Pipe would be laid along the first stream reach to be dewatered and sand bag cofferdams are constructed at the inlet and outlet of the pipe. The water would now be diverted into the pipe at the top of the first reach and pumping of this section would be able to begin. While the first section is being pumped dry, a third cofferdam would be constructed at the lower end of the second reach, but it would not be completely closed off. Pipe would be laid from the third cofferdam up through the second one, which would now be dewatered on the upstream side. Once the first stream reach has been determined to be free of pike, the first cofferdam can be removed and flow restored this reach. The flow would then be intercepted by the pipe at the second cofferdam and piped past the second reach. The opening in the third cofferdam would then be closed and the second reach would be isolated and ready for pumping. This process would then be repeated in a leap frog fashion progressing downstream.

It is estimated that the cofferdams would be spaced from 300 feet up to 1,000 feet apart, as stream conditions dictate. If it is assumed that the cofferdams disturb a 10-foot by 50-foot strip across the stream bottom and there is an average of 10 cofferdams placements per mile, the ground disturbance would be 0.11 acre per mile, or approximately 5 acres for the estimated 44 miles of stream. In addition to the ground disruption caused by the cofferdams, there would be disruption to the streambed between the cofferdams to ensure that there are no remaining water pockets or scour holes left that can harbor fish. This could amount to an area equal to or greater than the area disturbed by the cofferdams. Finally, any riparian or aquatic vegetation that precludes pumping or viewing the stream channel, or otherwise inhibits access to or movement within the channel, would have to be removed.

Access roads would be required along the length of each perennial stream to provide for the movement of pipe, pumps, fuel, cofferdam materials, work crews, and miscellaneous supplies and equipment. Existing roads along the creeks would be used, and all terrain

[7] For riparian disturbance, at least one opening 10 to20 feet wide at intervals not more than 1,000 feet would be needed for access to the creeks.

vehicles would be used to access other locations when feasible. Vehicle stream crossings or new roads may not be necessary.

For Alternative E, four staging areas totaling 3.5 acres would be needed for work along the tributaries. These staging areas would be located 300 feet or more from the USFS's riparian buffer along the creeks.

1. One acre adjacent to where the perimeter road crosses Old House Creek (N39-55.73, W120-34.76). This would be the primary staging area for the treatment of Big Grizzly and Old House creeks.
2. One-half acre near the crossing of the perimeter road and Freeman Creek (N39-54.72, W120-34.05).
3. One-half acre near the crossing of the perimeter road and Cow Creek (N35-54.20, W120-33.21).
4. Another staging area would be up to 1.5 acres in the meadow near the west abutment of the dam (N39-53.03, W120-28.65). This area would be used for secure staging and material stockpiling and would serve the other three staging areas.

The area at the dam would be used for staging the pumps and other equipment needed to draw down the reservoir dead pool.

2.8.2.3 Springs, Seeps, and Potholes

There are springs, seeps, and flooded potholes located along Big Grizzly Creek and the other tributary creeks. These features may flood during spring runoff, allowing pike to gain access, and then be cutoff from the main stream when the flow recedes. If conditions are right, pike may survive in these features. Any springs, seeps, and flooded potholes along the tributary stream channels would be dewatered.

2.8.2.4 Project Timeframe and Duration

Draining of the reservoir could begin once all project approvals are obtained. Thereafter, drawdown could begin. This could occur as early as January 2007. The reservoir should be completely drained by August 31 or earlier to allow for a one-month period of operations in the reservoir bottom.

Refill of the reservoir would begin as soon as the eradication project is completed. The time to refill the reservoir would depend on winter precipitation. Under Alternative E, it would take from one to three years to draw Lake Davis down to zero acre-feet. Drawdown time could be shortened by supplemental pumping. It would take between 1 and 6+ years (80 months) to refill the reservoir to the 45,000-acre-foot level depending on subsequent water year(s) (based on the record from 1968 through 2004). The perennial tributary streams would be diverted and dewatered from July through September, when stream flow is at its minimum. If stream flow in a tributary exceeds 5 cfs, treatment of that tributary would have to be delayed until it recedes to 5 cfs. Access roads would be developed (if needed) shortly after snowmelt. Springs, seeps, and flooded potholes would also be dewatered from July through September, while the tributaries are being treated.

2.8.2.5 Screening and Pike Containment

The DWR Northern Pike Containment System at the outlet of Lake Davis on Big Grizzly Creek (DWR 2006a) is scheduled to be in operation before January 2007, which is the earliest time drawdown of the reservoir would begin in the event a project is approved. This facility will prevent all live lifestages of pike from emigrating from the reservoir through this facility during drawdown.

2.8.3 Plumas National Forest Closures

For Alternative E, Closure 1 would be implemented. See Section 2.3.8.1 for a description of Closure 1. Closure 2 would also be implemented, but for the purposes of protecting the public from intensive construction activities. A special use permit would be issued to the DFG by the PNF.

2.9 Alternatives Considered but Eliminated from Further Evaluation

The Alternatives Formulation Report (AFR) (Appendix C) discusses many potential options and alternatives, including those preliminarily identified in the 2004 Lake Davis Pike Eradication Options report (DFG 2004d), and those provided through public comments received during public scoping. (Public comments are summarized in the Scoping Report and subsequent Errata, which can be viewed at www.dfg.ca.gov/northernpike/.) The AFR explains the two-phase selection and assessment process for choosing the reasonable range of alternatives.

The formulation of alternatives for the proposed Lake Davis Pike Eradication Project was an iterative process. The DFG conducted an initial evaluation of the 33 options that had been suggested by various persons and/or agencies (DFG 2004). These options, which included both water-level control and eradication chemical agents, were described in the DFG's document titled *Lake Davis Northern Pike Eradication Options*, dated May 24, 2004 (DFG 2004d). Additional options were proposed by others during the project scoping process, public comment period, and interagency consultation and coordination. The options considered included: a variety of reservoir volumes from empty (0 acre-feet) to 50,000 acre-feet, a normal summer level; seven chemical agents: seven fisheries management activities that did not include use of a chemical agent; and five options that modified reservoir and/or tributary habitat. The DFG concluded that the use of formulated rotenone, or a blend of formulated rotenone, and rotenone powder combined with a large reservoir drawdown could be a feasible, effective, and safe method for eradicating pike from Lake Davis.

The proposed options were evaluated using a two-phased assessment approach. In Phase I, the options were reviewed to determine if they would accomplish the primary objective of the project to eradicate pike from Lake Davis and its tributaries. The options that met this criterion or that required more information to make this determination were then evaluated in Phase II against the second level criteria, which are: protection of public health and safety; timely implementation; use of a proven, effective method; compliance with applicable laws; technical feasibility; and, minimization of environmental impacts. In Phase II the options were evaluated against these criteria. As a result, a reasonable range of alternatives was selected for full analysis in the environmental document.

Of the six alternatives selected for full analysis, one non-chemical means of eradicating pike was selected for evaluation because it looked like the most feasible non-chemical method. Generally, dewatering of streams and lakes is a proven and effective method to kill fish. However, the feasibility of dewatering streams at this scale and setting (Lake Davis watershed) is questionable.

2.10 Comparison of Alternatives

Table 2.10-1 provides a summary comparison of features for six of the seven alternatives; it does not include the No Project alternative. Table 2.10-2 provides a comparison of the environmental impacts of the six project alternatives compared to No Project for several resources, using quantitative information when available to answer the question of whether there is an adverse impact (yes) or not (no).

2.11 Preferred Alternative

In the Draft EIR/EIS, the DFG has identified the preferred alternative to be the Proposed Project. The PNF identified a preference of issuing a special use permit and implementing the two forest closures. However, the EIR/EIS, including public comments on all of the alternatives and mitigation measures, will be considered in determining whether and how to approve a project.

2.12 Mitigation Measures and Monitoring

Mitigation measures are specific actions that would substantially lessen significant or adverse environmental impacts of the Proposed Project and project alternatives. They are actions that avoid, minimize, rectify, reduce, eliminate, or compensate for the significant impact. These measures should be feasible and implementable. Measures proposed for implementation are explained in the resource sections, and represent commitments by the DFG with the assistance of other agencies in some cases. See also Table S-2 for a listing of all necessary mitigation measures for each alternative. The Final EIR/EIS will consider public comments on these measures and indicate how monitoring or reporting of the mitigation could occur to ensure their implementation if a project is approved.

The DFG has determined that given the potential for environmental harm from the use of a pesticide on a large scale near a local community, it will continue and/or expand upon monitoring of the following resources:

- **Surface Water Quality**: Water quality in Lake Davis and Big Grizzly Creek will be monitored under a program developed by DFG in consultation with and as required by the California Department of Health Services, the Central Valley Regional Water Quality Control Board and in consultation with Plumas County Environmental Health.
- **Groundwater**: The DFG has initiated a groundwater level monitoring program with the California Department of Water Resources. A two-phase groundwater quality monitoring program of (1) DFG and DHS sampling immediately post-treatment and (2) an ongoing PCEH groundwater well monitoring that was included as part of the 1997 eradication project, and will continue to 2008.

- **Air Quality**: Monitoring of air pollutants would be conducted during and after the Project. Details of the air quality monitoring program would be developed and formalized as required by the NSAQMD and in consultation with Plumas County Environmental Health Department during the design phase of any approved project.

Table 2.10-1. Comparison of Project Features for Lake Davis Northern Pike Eradication Alternatives

Alternative	Proposed Project	A	B	C	D	E
Description	**Lower reservoir to 15,000 acre-feet and treat with liquid rotenone**	**Lower reservoir to 15,000 acre-feet and treat with liquid and powdered rotenone**	**Lower reservoir to 5,000 acre-feet and treat with liquid rotenone**	**Lower reservoir to 35,000 acre-feet and treat with liquid rotenone**	**Maintain reservoir to 48,000 acre-feet and treat with liquid rotenone**	**Completely drain reservoir and dewater all tributary waters**
Reservoir surface elevation	5,749	5,749	5,738	5,759	5,764	5,700
Miles of stream	34	34	38	32	30	44
Approximate standing water surface area (acres)	1,331	1,331	545	2,439	2,936	0
Treatment						
Reservoir treatment volume (acre-feet)	15,000	15,000	5,000	35,000	48,000	Dewater
Number of years treatment volume target is predicted to be reached by the identified date in 38 years modeled without supplemental pumping; numbers in parentheses are the number of years treatment volumes could be reached with supplemental pumping	Aug 1: 21 (27)	Aug 1: 21 (27)	Aug 1: 14 (21)	Aug 1: 34 (36)	Aug 1: 38 (38)	Aug 1: 10 (16)
	Sept 1: 27 (34)	Sept 1: 27 (34)	Sept 1: 21 (26)	Sept 1: 36 (38)	Sept 1: 38 (38)	Sept 1: 17 (21)
	Oct 1: 34 (36)	Oct 1: 34 (36)	Oct 1: 26 (34)	Oct 1:37 (38)	Oct 1: 38 (38)	Oct 1: 21 (29)
Time to refill (months) to 45,000 acre-feet	5 to 79 months 75% likelihood of refill by 21 months post-treatment	5 to 79 months 75% likelihood of refill by 21 months post-treatment	6 to 80 months 75% likelihood of refill by 39 months post-treatment	2 to 79 months 75% likelihood of refill by 19 months post-treatment	No refill required	6 to 80 months 75% likelihood of refill by 41 months post-treatment

Table 2.10-1. Comparison of Project Features for Lake Davis Northern Pike Eradication Alternatives

Alternative	Proposed Project	A	B	C	D	E
Type of Treatment						
Agent	Noxfish® or CFT Legumine® (liquid) plus gel balls from powder (possible)	Cube Powdered Fish Toxicant® (Powder) in reservoir and Noxfish® or CFT Legumine® (liquid) in streams	Noxfish® or CFT Legumine® (liquid) plus gel balls from powder (possible)	Noxfish® or CFT Legumine® (liquid) plus gel balls from powder (possible)	Noxfish® or CFT Legumine® (liquid) plus gel balls from powder (possible)	None
Estimated rotenone amount-reservoir	5,000 gallons	40,541 pounds	1,667 gallons	11,667 gallons	16,000 gallons	None
Estimated rotenone amount-streams[2]	260 gallons	260 gallons	275 gallons	230 gallons	200 gallons	None
Estimated number of drip stations[2]	27	27	35	24	21	None
Access and Staging						
Reservoir staging locations	Primary: Honker Cove Boat Launch Area Potential Additional: Camp 5 Boat Launch Area Mallard Cove Boat Launch.	Primary: Honker Cove Boat Launch Area Potential Additional: Camp 5 Boat Launch Area Mallard Cove Boat Launch.	Primary: Honker Cove Boat Launch Area Potential Additional: Camp 5 Boat Launch Area Mallard Cove Boat Launch.	Primary: Honker Cove Boat Launch Area Potential Additional: Camp 5 Boat Launch Area Mallard Cove Boat Launch.	Primary: Honker Cove Boat Launch Area Potential Additional: Camp 5 Boat Launch Area Mallard Cove Boat Launch.	Primary: Honker Cove Boat Launch Area Potential Additional: Camp 5 Boat Launch Area Mallard Cove Boat Launch.
Stream staging locations	Indicated on Figure 2-3.	Indicated on Figure 2-3.	Indicated on Figure 2-3.	Indicated on Figure 2-3.	Indicated on Figure 2-3.	4 staging areas
Staging area (acres)	<5	<5	<5	<5	<5	<5
DFG reservoir access locations (ramp sites)	Honker Cove Camp 5 Mallard Cove	Honker Cove Camp 5 Mallard Cove	Honker Cove Camp 5 Mallard Cove	Honker Cove Camp 5 Mallard Cove	Honker Cove Camp 5 Mallard Cove	Honker Cove Camp 5 Mallard Cove

Table 2.10-1. Comparison of Project Features for Lake Davis Northern Pike Eradication Alternatives

Alternative	Proposed Project	A	B	C	D	E
DFG access routes to streams and springs	General access would be by vehicle along existing roads. Other access will be by foot traffic and/or off-highway vehicles (OHVs). Use of OHVs would be determined during season prior to application and in consultation with the USFS. Routes dependent on runoff situation.	General access would be by vehicle along existing roads. Other access will be by foot traffic and/or off-highway vehicles (OHVs). Use of OHVs would be determined during season prior to application and in consultation with the USFS. Routes dependent on runoff situation.	General access would be by vehicle along existing roads. Other access will be by foot traffic and/or off-highway vehicles (OHVs). Use of OHVs would be determined during season prior to application and in consultation with the USFS. Routes dependent on runoff situation	General access would be by vehicle along existing roads. Other access will be by foot traffic and/or off-highway vehicles (OHVs). Use of OHVs would be determined during season prior to application and in consultation with the USFS. Routes dependent on runoff situation	General access would be by vehicle along existing roads. Other access will be by foot traffic and/or off-highway vehicles (OHVs). Use of OHVs would be determined during season prior to application and in consultation with the USFS. Routes dependent on runoff situation	Primary access would be along existing roads. Vehicular access needed for pump and pipe delivery and installation. Use of vehicles off-road would be determined during year of project and in consultation with the USFS. Routes dependent on runoff situation.
Fossil-fueled Equipment (hours of use)						
Helicopter	0	0	0	0	0	20
Watercraft	1,500	1,500	1,000	2,500	2,500	900
Vehicles	6,000	6,000	6,000	6,000	6,000	7,600
Pumps (dewatering tributaries and reservoir)	0	0	0	0	0	8,000
Pumps (potential supplemental pumps to dewater reservoir)	0-2,184	0-2,184	0-2,184	0-2,184	0-2,184	0
Pumps (rotenone application)	320	400	180	400	600	0

Notes:

1. Time to Drawdown: The frequency of years in which the target treatment volumes would be achieved by the 1st of the indicated month. Calculation of this value is based on reservoir inflow and elevations in years from 1967 through 2004 (38 years). In these calculations, it is assumed that the starting volume of the reservoir is 45,000 acre-feet on January 1 of the year of treatment. The number in parentheses indicates the number assuming supplemental pumping is employed. Pumping is based on a pumping rate of 75 cfs during the months of April, May, and September. No pumping is assumed to occur during June through August to accommodate downstream recreation. These probabilities do not include any additional flow reductions for downstream users. If such reductions are made, an additional 600 acre-feet would remain in the reservoir for every 1 month of 10 cfs reduction. If flow was reduced by 100 cfs for two months (mid-June to mid-August, an additional 12,000 acre-feet would remain in the reservoir on September 1.
2. Stream treatment assumptions: 10 cubic feet per second total streamflow, drip stations every 0.5 mile on main tributaries and two back-to-back stream treatments.

Table 2.10-2. Summary of Environmental Impacts for Project Alternatives

Resource Category	NO PROJECT Compared to Existing Conditions	PROPOSED PROJECT Treat at 15,000 Acre-Feet with Rotenone	ALTERNATIVE A Treat at 15,000 Acre-Feet with Powdered Rotenone	ALTERNATIVE B Treat at 5,000 Acre-Feet with Rotenone	ALTERNATIVE C Treat at 35,000 Acre-Feet with Rotenone	ALTERNATIVE D Treat at 48,000 Acre-Feet with Rotenone	ALTERNATIVE E Dewater Reservoir and Major Tributaries (No Chemical Treatment)
SURFACE WATER							
Potential Bank Erosion on Big Grizzly Creek-estimated instream flow	No	Less than or equal to 218 cfs	Less than or equal to 218 cfs	Less than or equal to 235 cfs	Less than or equal to 195 cfs	Less than or equal to 195 cfs	Less than or equal to 236 cfs
Is there potential for tributary incision and headcutting?	No	Yes, for 3 runoff seasons	Yes, for 3 runoff seasons	Yes, for 4 runoff seasons	Yes, for 3 runoff seasons	No	Yes, for 4 runoff seasons
GROUNDWATER							
Private well water levels	No	Drop of ~ 15 feet	Drop of ~ 15 feet	Drop of ~ 26 feet	Drop of ~ 5 feet	No decline	Drop of ~ 64 feet
Private well water quality	No	Yes, but low potential for contamination	Yes, but low potential for contamination	Yes, but low potential for contamination	Yes, but low potential for contamination	Yes, but low potential for contamination	No
AIR QUALITY							
Expose sensitive receptors to substantial pollutant concentrations?	No	Yes, but Forest Closure 2 would limit sensitive receptors	Yes, but Forest Closure 2 would limit sensitive receptors	Yes, but Forest Closure 2 would limit sensitive receptors	Yes, but Forest Closure 2 would limit sensitive receptors	Yes, but Forest Closure 2 would limit sensitive receptors	Yes, depending on number of people in vicinity of reservoir
Create objectionable odors affecting a substantial number of people?	No	Yes, but Forest Closure 2 would limit exposure to odor	Yes, but Forest Closure 2 would limit exposure to odor (from dead fish only, not rotenone)	Yes, but Forest Closure 2 would limit exposure to odor	Yes, but Forest Closure 2 would limit exposure to odor	Yes, but Forest Closure 2 would limit exposure to odor	Yes, depending on number of people in vicinity of reservoir
Result in particulate dust from equipment?	No	Yes, but Forest Closure 2 would limit exposure	Yes, but Forest Closure 2 would limit exposure	Yes, but Forest Closure 2 would limit exposure	Yes, but Forest Closure 2 would limit exposure	Yes, but Forest Closure 2 would limit exposure	Yes, depending on number of people in vicinity of reservoir
Result in dust from powdered rotenone for reservoir treatment	No	No	Yes, but protective measures would be taken during mixing	No	No	No	No

Table 2.10-2. Summary of Environmental Impacts for Project Alternatives

Resource Category	NO PROJECT Compared to Existing Conditions	PROPOSED PROJECT Treat at 15,000 Acre-Feet with Rotenone	ALTERNATIVE A Treat at 15,000 Acre-Feet with Powdered Rotenone	ALTERNATIVE B Treat at 5,000 Acre-Feet with Rotenone	ALTERNATIVE C Treat at 35,000 Acre-Feet with Rotenone	ALTERNATIVE D Treat at 48,000 Acre-Feet with Rotenone	ALTERNATIVE E Dewater Reservoir and Major Tributaries (No Chemical Treatment)
NOISE							
Transportation and staging noise	No	Yes, but Forest Closure 2 would limit exposure	Yes, but Forest Closure 2 would limit exposure	Yes, but Forest Closure 2 would limit exposure	Yes, but Forest Closure 2 would limit exposure	Yes, but Forest Closure 2 would limit exposure	No
Airboat noise	No	Yes, would use low power and Forest Closure 2 would limit exposure	Yes, would use low power and Forest Closure 2 would limit exposure	Yes, would use low power and Forest Closure 2 would limit exposure	Yes, would use low power and Forest Closure 2 would limit exposure	Yes, would use low power and Forest Closure 2 would limit exposure	Yes, boat use would be minimal
Neutralization station noise	No	Yes, noise reduction measures would be implemented	Yes, noise reduction measures would be implemented	Yes, noise reduction measures would be implemented	Yes, noise reduction measures would be implemented	Yes, noise reduction measures would be implemented	No
Construction noise	No	No	No	No	No	No	Yes, but compliance is required with noise regulations
Pumps and Generator noise	No	No	No	Yes, but Forest Closure 2 would limit exposure	No	No	Yes, noise reduction measures would be implemented
Helicopter noise	No	No	No	No	No	No	Yes, but helicopter paths and flights would be controlled
AQUATIC RESOURCES							
What amount of littoral habitat will be dewatered within Lake Davis?	None	1,507/53%	1,507/53%	2,293/81%	410/24%	0/0%	2,827/100%
How much reservoir habitat will remain at the drawdown target?	N/A	1,331/47%	1,331/47%	545/19%	2,429/86%	2,936/100+%	0/0%
How long will it take for the reservoir to refill to 45,000 acre-feet? (75% likelihood)	N/A	21 months	21 months	39 months	19 months	0 months	41 months

Table 2.10-2. Summary of Environmental Impacts for Project Alternatives

Resource Category	NO PROJECT Compared to Existing Conditions	PROPOSED PROJECT Treat at 15,000 Acre-Feet with Rotenone	ALTERNATIVE A Treat at 15,000 Acre-Feet with Powdered Rotenone	ALTERNATIVE B Treat at 5,000 Acre-Feet with Rotenone	ALTERNATIVE C Treat at 35,000 Acre-Feet with Rotenone	ALTERNATIVE D Treat at 48,000 Acre-Feet with Rotenone	ALTERNATIVE E Dewater Reservoir and Major Tributaries (No Chemical Treatment)
What impact would the alternative have on the fisheries of Lake Davis?	Pike would become the dominant species in the reservoir and spread to other waters within the state.	All pike would be eradicated. Trout would be restocked per the Fisheries Management Plan	All pike would be eradicated. Trout would be restocked per the Fisheries Management Plan	All pike would be eradicated. Trout would be restocked per the Fisheries Management Plan	All pike would be eradicated. Trout would be restocked per the Fisheries Management Plan	All pike would be eradicated. Trout would be restocked per the Fisheries Management Plan	This alternative appears to be infeasible. Fish would likely survive in pockets. The abundance of all species would be reduced, but would recover within a few years
What impact would the alternative have on the macroinvertebrate communities of Lake Davis?	Pike may eventually feed on macroinvertebrates which could deplete the macroinvertebrate population.	The zooplankton community would recover within a few months. The littoral community may take 2 years or longer to recover.	The zooplankton community would recover within a few months. The littoral community may take 2 years or longer to recover.	The zooplankton community would recover within a few months. The littoral community may take 2 years or longer to recover.	The zooplankton community would recover within a few months. The littoral community may take 2 years or longer to recover.	The zooplankton community would recover within a few months. The littoral community may take 2 years or longer to recover.	This alternative would likely have more substantial impacts than those using rotenone, due to impacts on more species and the longer time for the reservoir to refill
What impact would the alternative have on fisheries of streams tributary to Lake Davis?	Pike would become the dominant species in the reservoir and spread to other waters within the state.	All pike would be eradicated. Trout would be restocked per the Fisheries Management Plan	All pike would be eradicated. Trout would be restocked per the Fisheries Management Plan	All pike would be eradicated. Trout would be restocked per the Fisheries Management Plan	All pike would be eradicated. Trout would be restocked per the Fisheries Management Plan	All pike would be eradicated. Trout would be restocked per the Fisheries Management Plan	This alternative appears to be infeasible. Fish would survive in pockets. There abundance would be greatly reduced, but would recover within a few years
What impact would the alternative have on the fisheries of streams tributary to Lake Davis?	Pike would become the dominant species in the reservoir and spread to other waters within the state.	The invertebrate community would re-establish within a few months.	The invertebrate community would re-establish within a few months.	The invertebrate community would re-establish within a few months.	The invertebrate community would re-establish within a few months.	The invertebrate community would re-establish within a few months.	This alternative would likely have a greater effect on invertebrate communities than the other alternatives, as it would affect more species.

Table 2.10-2. Summary of Environmental Impacts for Project Alternatives

Resource Category	NO PROJECT Compared to Existing Conditions	PROPOSED PROJECT Treat at 15,000 Acre-Feet with Rotenone	ALTERNATIVE A Treat at 15,000 Acre-Feet with Powdered Rotenone	ALTERNATIVE B Treat at 5,000 Acre-Feet with Rotenone	ALTERNATIVE C Treat at 35,000 Acre-Feet with Rotenone	ALTERNATIVE D Treat at 48,000 Acre-Feet with Rotenone	ALTERNATIVE E Dewater Reservoir and Major Tributaries (No Chemical Treatment)
What impact would the alternative have on the fisheries of springs tributary to Lake Davis?	Pike would become the dominant species in the reservoir and spread to other waters within the state.	Fish would likely be eradicated. These habitats do not support self-sustaining fish populations.	Fish would likely be eradicated. These habitats do not support self-sustaining fish populations.	Fish would likely be eradicated. These habitats do not support self-sustaining fish populations.	Fish would likely be eradicated. These habitats do not support self-sustaining fish populations.	Fish would likely be eradicated. These habitats do not support self-sustaining fish populations.	Fish would likely be eradicated. These habitats do not support self-sustaining fish populations.
What impact would the alternative have on macroinvertebrate community of springs tributary to Lake Davis?	Pike may eventually feed on macroinvertebrates which could deplete the macroinvertebrate population.	The invertebrate community would re-establish within a few months.	The invertebrate community would re-establish within a few months	The invertebrate community would re-establish within a few months	The invertebrate community would re-establish within a few months	The invertebrate community would re-establish within a few months	This alternative would likely have a greater effect on invertebrate communities that the other alternatives, as it would affect more species.
What impact would the alternative have on the fisheries of Big Grizzly Creek downstream of Lake Davis?	Pike would become the dominant species in the reservoir and spread to other waters within the state.	There would be substantial impacts on young-of-year fish during the year of treatment due to drawdown. Neutralization may also impact fish populations with ¼ to ½ mile of the dam Fish populations are expected to recover within a year.	There would be substantial impacts on young-of-year fish during the year of treatment due to drawdown. Neutralization may also impact fish populations with ¼ to ½ mile of the dam Fish populations are expected to recover within a year.	There would be substantial impacts on young-of-year fish during the year of treatment due to drawdown. Neutralization may also impact fish populations with ¼ to ½ mile of the dam Fish populations are expected to recover within a year.	There would be less than significant impacts on young-of-year fish during the year of treatment due to drawdown, as less water would have to be release. Neutralization may also impact fish populations with ¼ to ½ mile of the dam Fish populations are expected to recover within a year.	There would be less than significant impacts on young-of-year fish during the year of treatment due to drawdown, as no additional water would need to be released relative to normal operations Neutralization may also impact fish populations with ¼ to ½ mile of the dam Fish populations are expected to recover within a year.	There would be substantial impacts on young-of-year fish during the year of treatment due to drawdown. Fish populations are expected to recover within a year.

Table 2.10-2. Summary of Environmental Impacts for Project Alternatives

Resource Category	NO PROJECT Compared to Existing Conditions	PROPOSED PROJECT Treat at 15,000 Acre-Feet with Rotenone	ALTERNATIVE A Treat at 15,000 Acre-Feet with Powdered Rotenone	ALTERNATIVE B Treat at 5,000 Acre-Feet with Rotenone	ALTERNATIVE C Treat at 35,000 Acre-Feet with Rotenone	ALTERNATIVE D Treat at 48,000 Acre-Feet with Rotenone	ALTERNATIVE E Dewater Reservoir and Major Tributaries (No Chemical Treatment)
What impact would the alternative have on the macroinvertebrate community of Big Grizzly Creek downstream of Lake Davis?	Pike may eventually feed on macroinvertebrates which could deplete the macroinvertebrate population.	The higher flows during drawdown would result in a change in community composition. Neutralization may affect macroinvertebrate communities within 0.25 to 0.5 mile of the dam. These communities are expected to re-establish within a year.	The higher flows during drawdown would result in a change in community composition. Neutralization may affect macroinvertebrate communities within 0.25 to 0.5 mile of the dam. These communities are expected to re-establish within a year.	The higher flows during drawdown would result in a change in community composition. Neutralization may affect macroinvertebrate communities within 0.25 to 0.5 mile of the dam. These communities are expected to re-establish within a year.	There would be less effect on macroinvertebrate communities as the quantity of water to released would be less. Neutralization may affect macroinvertebrate communities within 0.25 to 0.5 mile of the dam. These communities are expected to re-establish within a year	There would be no effect on macroinvertebrate communities from drawdown, as no additional water would be released. Neutralization may affect macroinvertebrate communities within 0.25 to 0.5 mile of the dam. These communities are expected to re-establish within a year	The higher flows during drawdown would result in change in community composition. These communities are expected to recover within a year.
WILDLIFE RESOURCES							
Impacts to fish-eating terrestrial wildlife	Yes, based on decrease in non-pike species	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented
Impacts to insectivorous terrestrial wildlife due to temporary reduction of the aquatic invertebrate community through treatment and/or drawdown of Lake Davis	No	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented

Table 2.10-2. Summary of Environmental Impacts for Project Alternatives

Resource Category	NO PROJECT Compared to Existing Conditions	PROPOSED PROJECT Treat at 15,000 Acre-Feet with Rotenone	ALTERNATIVE A Treat at 15,000 Acre-Feet with Powdered Rotenone	ALTERNATIVE B Treat at 5,000 Acre-Feet with Rotenone	ALTERNATIVE C Treat at 35,000 Acre-Feet with Rotenone	ALTERNATIVE D Treat at 48,000 Acre-Feet with Rotenone	ALTERNATIVE E Dewater Reservoir and Major Tributaries (No Chemical Treatment)
Exposure of terrestrial wildlife to rotenone through direct contact, ingestion of treated water, or consumption of fish killed by rotenone	N/A	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	N/A
Disturbance to terrestrial wildlife	No	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes
Reduction of aquatic and wetland habitat used by terrestrial wildlife	No	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	No	Yes, but mitigation would be implemented	No	Yes, but mitigation would be implemented
BOTANICAL RESOURCES							
Temporary loss of non-sensitive terrestrial vegetation	No	Yes, but less than significant and mitigation would further reduce impact	Yes, but less than significant and mitigation would further reduce impact	Yes, but less than significant and mitigation would further reduce impact	Yes, but less than significant and mitigation would further reduce impact	Yes, but less than significant and mitigation would further reduce impact	Yes, but less than significant and mitigation would further reduce impact
Temporary loss of riparian vegetation	No	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented
Temporary loss of wetland vegetation	No	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented
Impacts to special-status plant species	No	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented

Table 2.10-2. Summary of Environmental Impacts for Project Alternatives

Resource Category	NO PROJECT Compared to Existing Conditions	PROPOSED PROJECT Treat at 15,000 Acre-Feet with Rotenone	ALTERNATIVE A Treat at 15,000 Acre-Feet with Powdered Rotenone	ALTERNATIVE B Treat at 5,000 Acre-Feet with Rotenone	ALTERNATIVE C Treat at 35,000 Acre-Feet with Rotenone	ALTERNATIVE D Treat at 48,000 Acre-Feet with Rotenone	ALTERNATIVE E Dewater Reservoir and Major Tributaries (No Chemical Treatment)
Noxious weed colonization of ground disturbed by project-related actions	No	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented
LAND USE							
Exposed gap in fencing with Lake Davis drawdown	No	Yes, but impact is temporary and additional fencing could be constructed	Yes, but impact is temporary and additional fencing could be constructed	Yes, but impact is temporary and additional fencing could be constructed	Yes, but impact is temporary and additional fencing could be constructed	No	Yes, but impact is temporary and additional fencing could be constructed
Traffic overlap and worker safety from Proposed Project and Freeman Project	No	Yes, but impact is temporary and mitigation would be implemented	Yes, but impact is temporary and additional fencing could be constructed	Yes, but impact is temporary and additional fencing could be constructed	Yes, but impact is temporary and additional fencing could be constructed	Yes, but impact is temporary and additional fencing could be constructed	Yes, but impact is temporary and additional fencing could be constructed
AESTHETICS							
Change in appearance of Big Grizzly Creek due to neutralization activities	No	Yes, but number of people that could observe this color change would be low	Yes, but number of people that could observe this color change would be low	Yes, but number of people that could observe this color change would be low	Yes, but number of people that could observe this color change would be low	No	No
Acres of exposed lakebed from drawdown	N/A	2,500	2,500	3,100	500	0	3,500
CULTURAL							
Potential for bank erosion during reservoir drawdown	N/A	Yes, will include monitoring, agency consult and appropriate actions	Yes, will include monitoring, agency consult and appropriate actions	Yes, will include monitoring, agency consult and appropriate actions	Yes, will include monitoring, agency consult and appropriate actions	No	Yes, will include monitoring, agency consult and appropriate actions
Ground disturbance in staging areas	N/A	Yes, but areas can be avoided	Yes, but areas can be avoided	Yes, but areas can be avoided	Yes, but areas can be avoided	Yes, but areas can be avoided	Yes, but areas can be avoided
Ground disturbance from ramp extensions	N/A	Yes, but areas can be avoided	Yes, but areas can be avoided	Yes, but areas can be avoided	Yes, but areas can be avoided	No, extensions not needed	Yes, but areas can be avoided

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Resource Category	NO PROJECT Compared to Existing Conditions		PROPOSED PROJECT Treat at 15,000 Acre-Feet with Rotenone		ALTERNATIVE A Treat at 15,000 Acre-Feet with Powdered Rotenone		ALTERNATIVE B Treat at 5,000 Acre-Feet with Rotenone		ALTERNATIVE C Treat at 35,000 Acre-Feet with Rotenone		ALTERNATIVE D Treat at 48,000 Acre-Feet with Rotenone		ALTERNATIVE E Dewater Reservoir and Major Tributaries (No Chemical Treatment)	
RECREATION														
Crowding at Frenchman Lake	No		Yes, but mitigation would be implemented		Yes, but mitigation would be implemented		Yes, but mitigation would be implemented		Yes, but mitigation would be implemented		No		Yes, but mitigation would be implemented	
Constraints on Big Grizzly Creek Recreation	No		Yes, but mitigation would be implemented		Yes, but mitigation would be implemented		Yes, but mitigation would be implemented		No		No		Yes, Ice Pond use would be lost for 90 days	
Loss of recreation use at Lake Davis	Yes, with a gradual decline		Yes, but mitigation would be implemented		Yes, but mitigation would be implemented		Yes, but mitigation would be implemented		Yes, but mitigation would be implemented		Yes, but very short-term		Yes, for up to four seasons	
Range of total visitor use over 21 year period (based on two refill scenarios)	N/A		1,880,935 to 1,906,213 visitors		1,880,935 to 1,906,213 visitors		1,840,018 to 1,894,128 visitors		1,893,994 to 1,906,479 visitors		1,916,195 visitors (higher use)		1,828,571 to 1,894,128 visitors	
ECONOMICS	**Short Term[1,2,3]**	**Overall[1,2,4]**	**Short Term[1,2,3]**	**Overall[1,2,4]**	**Short Term[1,2,3]**	**Overall[1,2,4]**	**Short Term[1,2,3]**	**Overall[1,2,4]**	**Short Term[1,2,3]**	**Overall[1,2,4]**	**Short Term[1,2,3]**	**Overall[1,2,4]**	**Short Term[1,2,3]**	**Overall[1,2,4]**
Local Economic Activity Total Output	Yes $2.04m	Yes $1.84m	Yes $1.61–$1.73m	No (Benefit of $2.23–2.26m)	Yes $1.61–$1.73m	No (Benefit of $2.23–$2.26m)	Yes $1.42–$1.66m	Yes $2.19–$2.24m	Yes $1.67–$1.73m	No (Benefit of $2.25–$2.26m)	Yes $1.76m	No (Benefit of $2.28m)	Yes $1.37–$1.66m	Yes $2.17–$2.25m
Fiscal Revenues	Yes $43,900	Yes $39,700	Yes $34,700-$37,300	No (Benefit of $48,200-$48,800)	Yes $34,700-$37,300	No (Benefit of $48,200-$48,800)	Yes $30,600-$35,700	Yes $47,100-$48,400	Yes $36,000-$37,300	No (Benefit of $48,500-$48,800)	Yes $38,000	No (Benefit of $49,100)	Yes $29,600-$35,700	Yes $46,800-$48,500
Water Supply Costs and Benefits	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Economic Values – Recreation	Yes $5.76m	Yes $5.19m	Yes $4.54-$4.88m	No (Benefit of $6.30-$3.39m)	Yes $4.54-$4.88m	No (Benefit of $6.30-$3.39)	Yes $4.00-$4.67m	Yes $6.16-$6.33m	Yes $4.71-$4.88m	No (Benefit of $6.34-$6.39)	Yes $4.97m	No (Benefit of $6.42)	Yes $3.87-$4.68m	Yes $6.13-$6.35m
Statewide Economic Activity	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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PUBLIC SERVICES							
Impact on domestic water supply	No	Yes, but potential impact would be temporary and replacement water would be provided through mitigation	Yes, but potential impact would be temporary and replacement water would be provided through mitigation	Yes, but potential impact would be temporary and replacement water would be provided through mitigation	Yes, but potential impact would be temporary and replacement water would be provided through mitigation	Yes, but potential impact would be temporary and replacement water would be provided through mitigation	Yes, but potential impact would be temporary and replacement water would be provided through mitigation
Impact on downstream water supply	Yes, based on continued presence of pike and related potential for pike escapement and human transport	Yes, but impact is temporary and mitigation would be implemented	Yes, but impact is temporary and mitigation would be implemented	Yes, but impact is temporary and mitigation would be implemented	Yes, but impact is temporary and mitigation would be implemented	Yes, but impact is temporary and mitigation would be implemented	Yes, but impact is temporary and mitigation would be implemented
Impact on law enforcement services	Yes	Yes, but impact is temporary	Yes, but impact is temporary	Yes, but impact is temporary	Yes, but impact is temporary	Yes, but impact is temporary	Yes, but impact is temporary
Impact on fire protection and emergency services	No	Yes, but impact is temporary	Yes, but impact is temporary	Yes, but impact is temporary	Yes, but impact is temporary	Yes, but impact is temporary	Yes, but impact is temporary
Impact on solid waste disposal services	No	Yes, but impact is temporary	Yes, but impact is temporary	Yes, but impact is temporary	Yes, but impact is temporary	Yes, but impact is temporary	Yes, but impact is temporary
HUMAN AND ECOLOGICAL HEALTH							
Toxicity effects to non-target fish	N/A	Yes, but impact is temporary with restocking	Yes, but impact is temporary with restocking	Yes, but impact is temporary with restocking	Yes, but impact is temporary with restocking	Yes, but impact is temporary with restocking	No
Toxicity effects to aquatic invertebrates	N/A	Yes, time for littoral macroinvertebrate communities to fully re-establish may exceed two years	Yes, time for littoral macroinvertebrate communities to fully re-establish may exceed two years	Yes, time for littoral macroinvertebrate communities to fully re-establish may exceed two years	Yes, time for littoral macroinvertebrate communities to fully re-establish may exceed two years	Yes, time for littoral macroinvertebrate communities to fully re-establish may exceed two years	No

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Toxicity effects on amphibians and reptiles	N/A	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	No
Ecological effects from dead fish	N/A	Yes, but less than significant	Yes, but less than significant	Yes, but less than significant	Yes, but less than significant	Yes, but less than significant	No
Toxicity effects to humans from surface water exposure	N/A	Yes, possible but unlikely effect for some youth sectors of the public	Yes, possible but unlikely effect for some youth sectors of the public	Yes, possible but unlikely effect for some youth sectors of the public	Yes, possible but unlikely effect for some youth sectors of the public	Yes, possible but unlikely effect for some youth sectors of the public	No
Toxicity effects to humans from sediment exposure	N/A	Yes, possible but unlikely effect for some youth sectors of the public	Yes, possible but unlikely effect for some youth sectors of the public	Yes, possible but unlikely effect for some youth sectors of the public	Yes, possible but unlikely effect for some youth sectors of the public	Yes, possible but unlikely effect for some youth sectors of the public	No
Toxicity effects to humans from drinking water exposure via wells	N/A	Yes, but less than significant	Yes, but less than significant	Yes, but less than significant	Yes, but less than significant	Yes, but less than significant	No
Toxicity effects to humans from inhalation exposure	N/A	No if combination/ balance of rotenone formulations are used	Yes, but mitigation would be implemented	No if combination/ balance of rotenone formulations are used	No if combination/ balance of rotenone formulations are used	No if combination/ balance of rotenone formulations are used	No
Impacts to humans from odors	N/A	Yes, but less than significant	Yes, but less than significant	Yes, but less than significant	Yes, but mitigation would be implemented	Yes, but mitigation would be implemented	No
Neutralization impacts on human and ecological health, Options 3 and 4	N/A	Yes, but less than significant	Yes, but less than significant	Yes, but less than significant	Yes, but less than significant	Yes, but less than significant	No
Effects of fugitive rotenone dust on wildlife	N/A	No	Yes, but mitigation would be implemented	No	No	No	No
Effects of fugitive rotenone dust on humans	N/A	No	Yes, but mitigation would be implemented	No	No	No	No

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SOCIAL ISSUES & ENVIRONMENTAL JUSTICE	**Short Term**	**Overall**	**Short Term**	**Overall**	**Short Term**	**Overall**	**Short Term**	**Overall**	**Short Term**	**Overall**	**Short Term**	**Overall**	**Short Term**	**Overall**
Recreation economy impacts on low-income population	No	Yes, over the next 20 years, losses of about $0.15 million in output, $90,500 in income and 4 jobs per year.	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No

[1]Monetary values presented in constant 2005 dollars

[2]Monetary values presented in millions of dollars, except for Fiscal Revenues, which are reported in absolute terms.

[3]Values presented in the table for the project alternatives represent average annual undiscounted values over a 5-year timeframe (2007–2011).

[4]Values presented in the table for the project alternatives represent average annual undiscounted values over a 20-year timeframe (2007–2026).